INDIAN INSTITUTE OF TECHNOLOGY KANPUR

Name of work

Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur.

BID DOCUMENT

SUPERINTENDING ENGINEER
INDIAN INSTITUTE OF TECHNOLOGY KANPUR
April 2025

Contents

*It is certified that this document contains **144** pages starting with Page No. i*

Superintending Engineer

1 Notice Inviting e-Tenders

The Superintending Engineer on behalf of Board of Governors of Indian Institute of Technology Kanpur invites online percentage rate tenders from enlisted contractors in CPWD and/ or the eligible firms / agencies satisfying the eligibility criteria mentioned in the document.

NIT No: 01/AC/EE/2025

1	Name of work	:	**Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur.**
2	Estimated Cost exclusive of GST	:	**Rs. 30,24,19,266.00**
3	Earnest Money Deposit (Rs.)	:	**Rs. 40,24,193/-** (In favour of Director IIT Kanpur)
4	Duration of contract	:	**Twelve** (12) months
5	**Last Time & date of submission of bids (Up to)**	:	As per CPP portal data (https://eprocure.gov.in/eprocure/app)
6	**Opening of bids**	:	As per CPP portal data
7	**Time allowed for sub- mission of requisite documents by lowest bidder**	:	Within **One week** of opening of financial bids

The bid forms and other details may be downloaded from Central Public Procurement Portal (http://eprocure.gov.in/eprocure/app). Aspiring bidders who have not enrolled / registered in e-procurement should enroll / register themselves before participating through web site http://eprocure.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at "Instructions for online bid submission."

Bidders can access quotation / tender documents on the website (for searching in the NIC site), kindly go to quotation search option and type 'IIT'. Thereafter, click on "GO" button to view all IIT quotations. Select the appropriate quotation / tender and fill them with all relevant information and submit the completed Quotation / Tender document online on the website http://eprocure.gov.in/eprocure/app as per the schedule given in the next page.

Note: No manual bids will be accepted. All bids (both Technical & Financial) should be submitted in the e-procurement portal.

Applicants are advised to keep visiting the above-mentioned websites from time to time (till the deadline for bid submission) for any updates in respect of the tender documents, if any. Failure to do so shall not absolve the applicant of his liabilities to submit the applications complete in all respect including updates thereof, if any. An incomplete application may be liable for rejection.

Superintending Engineer

2 Information and Instructions for Bidders for E-Tendering

The Superintending Engineer on behalf of Board of Governors of Indian Institute of Technology Kanpur invites online percentage rate tenders from enlisted contractors in CPWD and/ or the eligible firms / agencies satisfying the eligibility criteria mentioned in the document

2.1 Schedule

1	Name of organization	:	Indian Institute of Technology Kanpur
2	NIT No	:	01/AC/EE/2025
3	Location	:	Indian Institute of Technology Kanpur
4	Tender / Quotation type (open / limited / EOI / auction / single)	:	Open
5	Tender / Quotation category (services / goods /works)	:	Works
6	Type of Contract (work / supply / auction / service / buy / empanelment / sell)	:	Work
7	Form of contract (IITK-7/8)	:	IITK-7
8	Work Category Electrical	:	Electrical
9	Is multi-currency allowed?	:	No
10	Date of publishing / issue / start	:	As per CPP portal
11	Document download start date	:	As per CPP portal
12	Document download end date	:	As per CPP portal
13	Date & time of pre-bid meeting	:	As per CPP portal
14	Venue of pre-bid meeting	:	SE office, IWD IITK
15	Last date & time of uploading of bids	:	As per CPP portal
16	Date & time of opening of Technical bids	:	As per CPP portal
17	Bid Validity Days	:	90 days after opening of technical bid
18	Earnest Money Deposit (EMD)	:	**Rs. 40,24,193**/- Scanned copy of the proof of EMD deposition to be uploaded with the tender. The hardcopy of the EMD receipt shall be submitted in the office of Executive Engineer (Electrical & AC) IWD IIT Kanpur

19	Non- Refundable Processing Fee (Inclusive of GST @18%)	NIL
20	No. of Bids / Covers (1 / 2 / 3 / 4)	: 2
21	Address for communication	: Office of Superintending Engineer- Indian Institute of Techno- logy Kanpur, Kanpur, U.P. Pin - 208016
22	e-mail address	: vktiwari@iitk.ac.in, rakeshkv@iitk.ac.in

The intending bidder must read the terms and conditions of CPWD-6 carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.

1. Information and instructions for bidders posted on website shall form part of bid document.
2. The bid document consisting of drawings, specifications, schedule of quantities of items to be executed, schedule of stages for payment as applicable and the set of terms & conditions of the contract to be complied with and other necessary documents can be seen and downloaded free of cost from www.eprocure.gov.in
3. But the bid can only be submitted after deposition of e processing fee and proof of submission of EMD.
4. Those contractors not registered on the website mentioned above, are required to get re- gistered beforehand. Only e-bids shall be accepted on website CPP portal through e- tendering processes.
5. The intending bidder must have valid Class-III digital signature to submit the bid.
6. On opening date, the contractor can login and see the bid opening process. After opening of bids, he will receive the competitor bid sheets.
7. Contractor can upload documents in the form of JPG format and PDF format.
8. Contractor must ensure to quote rate of each item. The column meant for quoting rate in figures appears in pink colour and the moment rate is entered, it turns sky blue.

   In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as "0". Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO).

However, if a tenderer does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.

9. The "Eligibility/technical Bid" shall be opened first on due date and time as per the evaluation scheme. The "Financial Bid" of bidders qualifying the technical bid shall be opened on a later date as to be announced in CPP portal.
10. The bidders are advised to visit the site before submission of bids to have more clarity about the site conditions and availability of space for execution of the work.
11. All modifications/addendums/corrigendum issued regarding this bidding process shall be uploaded on website only.
12. The department reserves the right to reject any or all bids without assigning any reason thereof and may restrict the list of qualified bidders to any number deemed suitable by it, if too many bids are received satisfying the minimum laid down criteria.
13. The rates for all items of work, shall unless clearly specified otherwise, include cost of all operations and all inputs of labour, material, T&P, scaffolding, wastages, watch and ward, other inputs, all incidental charges, all taxes, cess, duties, levies, etc. exclusive of GST required for execution of the work.
14. If the work involves addition/upgradation/alteration/renovation the work shall be in compliance with 3 Star GRIHA rating and as per environmental policies of Institute. Nothing extra shall be payable on this account.
15. The enlistment of the contractors, if applicable, should be valid on the last date of submission of bids. In case the last date of submission of bid is extended, the enlistment of contractor should be valid on the original date of submission of bids.
16. The description of the work is as follows: "**Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur.**
17. The work is estimated to cost **Rs. 30,24,19,266/-** However, this estimate given is mere approximation for guide.
18. Agreement shall be drawn with the successful bidders on prescribed Form No. CPWD 7 which is available as a Govt. of India Publication and also available on website www.cpwd.gov.in. Bidders shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.
19. The time allowed for carrying out the entire work will be Twelve (12) months from the date of start as defined in Schedule "F" or from the first date of handing over of the site, whichever is later, in accordance with the phasing as detailed in special conditions of contract in the bid document.
20. The sites for the work will be handed over as per the special terms and conditions of the document.

21. An approved programme of completion submitted by the contractor after award of work based on the available / to be available works for addition/alteration/upgradation.

22. The bid document consisting of NIT, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website www.eprocure.gov.in free of cost.

23. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.

24. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.

25. Earnest Money Deposit receipt scanned copy shall be uploaded to the e-Tendering website within period of submission.

26. Earnest money can be paid in the form of Treasury Challan or Demand Draft or Pay order or Banker's cheque or Deposit at call receipt or Fixed Deposit Receipt drawn in favor of Director IIT Kanpur along with Bank Guarantee of any Scheduled Bank where applicable.

    A part of earnest money is acceptable in the form of bank guarantee also in such case 50% of earnest money or Rs. 20 lacs, whichever is less, will have to be deposited in shape prescribed above and balance in shape of Bank Guarantee of any scheduled bank.

27. Copy of Enlistment Order and other documents as specified in the bid shall be scanned and uploaded to the e-tendering website within the period of bid submission.

28. The bid submitted shall be opened at as per the details provided in the CPP portal at DOIP office. The date of opening of Financial Bid shall be informed through web site after the opening of technical bid.

29. The bid submitted shall become invalid if:

    (i) The bidder is found ineligible.

    (ii) The bidder does not upload scanned copies of all the documents stipulated in the bid document.

    (iii) If a tenderer quotes nil rates against each item in item rate tender or does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.

30. The contractor whose bid is accepted will be required to furnish performance guarantee of 5% of tendered value within the period specified in Schedule F. This guarantee shall be in the form of or Deposit at Call receipt of any scheduled bank/ Banker's cheque of any scheduled bank/ Demand Draft of any scheduled bank/ Pay order of any Scheduled Bank of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form.

31. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F' including the extended period if any, the contractor shall be suspended for two years and shall not be eligible to bid for IITK tenders from the date of issue of suspension order.

32. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/ registrations or proof of applying for obtaining licenses, registration with EPFO, ESIC

and BOCW Welfare Board including Provident Fund Code No. If applicable and also ensure the compliance of afore said provisions by the sub-contractors, if any engaged by the contractor for the said work and program chart (Time and Progress) within the period specified in Schedule 'F'.

33. Intending Bidders are advised to inspect and examine the sites and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, making proper arrangements to the site for smooth operation, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. Bidder shall be deemed to have full knowledge of the sites whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. **The bidder shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents.** Submission of a bid by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Institute and local conditions and other factors having a bearing on the execution of the work.

34. Intending Bidders are advised to get familiarized with the specifications /rules related (i.e., **Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur,**to the work as approved by the competent authority and various policies related to c&d waste and other environmental guidelines of the institute pertaining to the. Bidder shall be deemed to have full knowledge of such rules and regulations whether he has read it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. In case of reduction of scope of work or no work is possible to carry out on account of such issues, no cost shall be payable to them. Submission of a bid by the bidder implies that he has read this notice and all other documents and has made himself aware of the Institute Regulations and other factors having a bearing on the execution of the work.

35. The competent authority on behalf of the Board of Governors does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without assigning any reason. Bids in which any of the prescribed conditions is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.

36. Canvassing whether directly or indirectly, in connection with bids is strictly prohibited and the bids submitted by the bidders who resort to canvassing will be liable to rejection.

37. The competent authority on behalf of the Board of Governors reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.

38. The contractor shall not be permitted to bid for works in the Office of Infrastructure and Planning / Institute Works Department responsible for award and execution of contracts, in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive) in IWD and Office of Infrastructure and Planning. He shall also intimate the names of persons

who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer in the Office of Infrastructure and Planning/ Institute Works Department. Any breach of this condition by the contractor would render him liable to be removed

from the approved list of contractors of this Department.

39. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be canceled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.

40. The bids for the work shall remain open for acceptance for a period of Ninety (90) days from the date of opening of bids. If any bidder withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, then the Institute shall, without prejudice to any other right or remedy, be at liberty to suspend the bidder for one year

41. This notice inviting Bid shall form a part of the contract document. The successful bidders/contractor, on acceptance of his bid by the Accepting Authority shall within 7 days from the stipulated date of start of the work, sign the contract consisting of the Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto

42. Standard C.P.W.D. Form 7 or other Standard C.P.W.D. Form as applicable.

43. The bid document will include the following components:

    (a) CPWD-7 and CPWD-6 including Schedule A to F for all the components of the work, Standard General Conditions of Contract for CPWD 2023 as amended/modified up to last date of submission of the bid.

    (b) General / specific conditions, specifications applicable to all components of the work.

44. After acceptance of the bid by competent authority, Superintending Engineer issue letter of award on behalf of the Board of Governors to the contractor. After the work is awarded, the contractor will have to enter into one agreement with Superintending Engineer. One such signed set of agreement shall be handed over to Engineer-In- Charge.

45. The requirement of technical staff given in various specialized works is as per requirements given in clause 32 of NIT document. The actual deployment of these technical staff will be as per execution of work and direction of the Superintending Engineer, IITK. **In case of non-deployment, a penalty of Rs. 25,000/- per month shall be levied from the** contractor.

46. Payment shall be regulated as under

    (a) 75% of the tendered value on receipt of all materials listed in BOQ at site be submitted to claim the payment.

    (b) 15% of the tendered value on installation and connection.

    (c) 10% of the tendered value on testing and commissioning.

47. Running bill and final bill for components shall be facilitated by Engineer-in-Charge to the contractor.

48. The work shall be treated as complete when all the components of the work are complete.

49. It will be obligatory on the part of bidder to sign the contract document for all components before

the first payment is released.

50. In case of reduction in scope of work no claim on account of reduction in value of work, loss of expected profit, consequential overheads etc. shall be entertained.

51. A team of officers from Indian Institute of Technology Kanpur may visit the office/ site of work of bidders for establishing their credibility and verification of submitted documents.

52. The work is urgent as requested by client/Institute and to be completed strictly in given time schedule as per special terms and conditions. The contractor has to deploy the labour and supervisory staff in shifts to meet the targeted completion date. The work may be executed in extended shifts or two shifts. The rates quoted by the contractor will be deemed to be inclusive of any extra expenditures on account of this reason. Nothing shall be paid on this account.

53. The contractor/ agency must have to co-operate with any other agency deployed by IIT Kanpur for laying of cables and other works for the agency has to make itself available and provide full co-operation during installation, if required.

54. The competent authority on behalf of the Board of Governors reserves the right to terminate the contract if,

    (a) **Any violation of labour law has been observed.**

    (b) **Any of the construction workers engaged in the works under this contract is found also engaged in Service Contracts of the Institute at the same time.**

55. The competent authority on behalf of the Board of Governors reserves the right to disqualify an agency for

    (a) **Non-compliance of Institute orders**

    (b) **Violation of Institute policies as established by the Competent Authority in the best interests of the Institute.**

2.2 Instructions for Online BID Submission

This tender document has been published on the Central Public Procurement Portal (URL: http://eprocure.gov.in/eprocure/app). The bidders are required to submit soft-copies of their bids electronically on the CPP portal, using valid Digital Signature Certificates (DSC). The instructions given below are meant to assist the bidders in registering on the CPP portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP portal.

More information useful for submitting online bids on the CPP portal may be obtained at http://eprocure.gov.in/eprocure/app

2.2.1 Registration

1. Bidders are required to enroll on the e-procurement module of the Central Public Procure- ment portal (URL:http://eprocure.gov.in/eprocure/app) by clicking on the link, “click here to enroll”. Enrolment on the CPP portal is free of charge.
2. As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for the accounts.
3. Bidders are advised to register their valid e-mail address and mobile number as part of the registration process. These would be used for any communication from the CPP portal.
4. Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (class 2 or class 3 certificates with signing key usage) issued by any certifying authority recognized by CCA India (e.g. Sify / TCS / nCode/ eMudhra etc.) with their profile.
5. Only one valid DSC should be registered by a bidder. Please note that bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
6. Bidder then logs in to the site through the secured log-in by entering their user ID Password and the password of the DSC / eToken.

2.2.2 Searching for tender documents

1. There are various search options built in the CPP portal to facilitate bidders to search active tenders by several parameters. These parameters could include tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP portal.
2. Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. The tenders can be moved to the respective "My Tenders" folder. This would enable the CPP portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3. The bidder should make a note of the unique Tender ID assigned to each other; in case they want to obtain any clarification/help from the Helpdesk.

2.2.3 Preparation of bids

1. Bidder should take into account any corrigendum published on the tender document before submitting their bids.
2. Please go through the tender advertisement and the tender document carefully to under- stand the documents required to be submitted as part of the bids. Please note the number of covers in which the bid documents have to be submitted. Any deviations from these may lead to rejection of the bids.
3. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black &white option.
4. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g., PAN card copy, annual reports, auditor's certificates, etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

2.2.4 Submission of bids

1. Bidder should log into the site well in advance for bid submission so that he / she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
2. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3. Bidder has to select the payment option as "on-line" to pay the tender processing fee as applicable and enter details of the instrument
4. A standard BOQ Format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to

download the BOQ file, open it and complete the white colored [unprotected] cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

OR

In some cases, financial bids can be submitted in PDF format as well (in lieu of BOQ).

5. The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
6. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.
7. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
8. Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date &time of submission of the bid with all other relevant details.
9. Add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

2.2.5 Assistance to bidders

1. Any queries relating to tender document and the terms and conditions contained therein should be addressed to the tender inviting authority for a tender or the relevant contact person indicated in the tender.
2. Any queries relating to the process of online bid submission or queries relating to CPP portal in general may be directed to the 24 x 7 CPP Portal Help Desk.

2.2.6 General instruction to bidders

1. The tenders will be received online through portal https://eprocure.gov.in/eprocure/app. In the technical bids, the bidders are required to upload all the documents in PDF format.
2. Possession of a valid class II / III Digital Signature Certificate (DSC) in the form of smart card / e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the websitehttps://eprocure.gov.in/eprocure/appunder the link "Information about DSC".

Tenderers are advised to follow the instructions provided in the "Instructions to the tenderer" for the e-submission of the bids online through the Central Public Procurement Portal for e-procurement athttps://eprocure.gov.in/eprocure/app.

Superintending Engineer
Institute Works Department

2.3 List of documents to be scanned and uploaded within the period of bid submission

The following mandatory documents to be submitted with online bid submission:

The Online bids (complete in all respect) must be uploaded online in two Envelops as explained here: -

2.3.1 Envelope - 1: Technical Bid

The following mandatory documents to be provided as **a single PDF** file in the same sequence as listed for evaluation:

1. Scanned copy of EMD
2. GST Registration Certificate or GST Undertaking as per 5.1
3. EPF & ESI Registration
4. Copy of PAN card
5. Affidavit for not being blacklisted/debarred/restrained As per 5.2
6. Turnover and Other Financial statement of the Agency as per 5.3
7. Bankers certificate as per 5.4 **Or** Net Worth Certificate from certified Chartered Accountant as per 5.5
8. Performance report of works executed as per 5.6
9. Structure and Organization of the Agency as per 5.7
10. Declaration on Details of the Bidder(s) as per 5.8
11. Details of Similar Nature of Works Completed as per 5.9
12. Declaration about Site Inspection as per 5.10
13. Enlistment order of the contractor in appropriate class and category issued by CPWD or others.
14. Certificate of Incorporation
15. Scanned copy of "A" class Electrical License.
16. Letter of Transmittal as per 5.11
17. Tender Acceptance Letter 5.12
18. Certificate for tender as per 5.13
19. CPWD-7 5.14
20. Technical datasheet of 33/11 kV 10 MVA transformer as per 5.15
21. Technical datasheet of 11/0.433 KV 2.5 MVA transformer as per 5.16
22. Technical datasheet of 11/0.433 KV 1.6 MVA transformer as per 5.17
23. Technical datasheet of 11/0.433 KV 0.630 MVA transformer as per 5.18
24. Technical datasheet of 1010 KVA DG set as per 5.19
25. Integrity Pact should be signed and scanned copy of the same shall be uploaded along with technical bid. At the time of award of the work the hard copy of the same on a non-judicial Stamp Paper of Rs.100/- shall be submitted which shall be the part of the contract agreement.

The hard copy of earnest money deposit receipt (EMD) shall be submitted in the office of Executive Engineer (Elect & AC), Central office IWD IIT Kanpur before the opening of the technical bid on **25.04.2025** till 3:00 PM. In absence of the EMD in hardcopy, the bidder shall be not eligible for opening of their technical bid and shall be rejected.

2.3.2 Envelope - 2: Financial Bid

Price bid should be submitted in BOQ format

3 Eligibility Criteria

3.1 Eligibility criteria for contractors

Contractors who fulfill the following criteria shall be eligible to apply.

Eligible Bidders
Eligible bidders should satisfy the following criteria for an eligible bid:

1. **Average annual financial turn over:**

   i. Average annual financial turnover of works should be at least 60% of the estimated cost of work put to tender during the last 3 consecutive financial years by the certified Chartered Accountant.

   Audited turnover statements to be furnished as proof of the same duly certified by chartered accountant along with Profit & Loss Statements.

   ii. Bankers certificate should be as per 5.5 **Or** Net Worth Certificate from certified Chartered Accountant as per 5.6
   Bankers certificate from a commercial bank or Net-worth certificate:

   Bankers certificate of the amount equal to 40% of the Estimate cost put to tender (ECPT)
   Or
   Net-Worth certificate of minimum 10% of the estimated cost put to tender issued by certified chartered Accountant with UDIN

2. **Experience (value of work done shall be within a span of one year):**

   Firms/Contractors must have completed satisfactorily
   i) One similar work of 80% value of the estimated cost put to tender Or
   ii) Two similar work of 60% value of the estimated cost put to tender or
   iii) Three similar work of 40% value of the estimated cost put to tender
   Works completed during last 7 years ending on date 21.04.2025.
   And
   One completed work of similar nature costing not less than Rs. 1209.68 Lacs with some Central Government Department / State Government Department / Central Autonomous Body / Central Public Sector Undertakings/State PSU/State Autonomous Body.

Definition of similar work: Similar type of work means "Construction of 33/11 KV substation or higher level with individual power transformer of capacity 8 MVA or higher and 11/0.433 KV substation works etc." done with any Central Government Department / Central Autonomous Body / Central Public Sector Undertakings /State Government/ State PSU/State Autonomous Body in last 7 years.

Note: The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to the previous day of last date of submission of tenders.

3. Having valid "A" Class Electrical License.

4. Should have average annual financial turnover of **Rs. 1814.52** Lacs of electrical works during the last three years ending 31-03-2024.

5. Bankers certificate from a commercial bank or Net-worth certificate:

Bankers certificate of the amount equal to 40% of the Estimate cost put to tender (ECPT)

Or

Net-Worth certificate of minimum 10% of the estimated cost put to tender issued by certified chartered Accountant with UDIN

6. Should have the calculated bidding capacity equal to or more than the estimated cost of the work.

7. Should have valid registration of EPF, ESIC and GST.

8. Technical datasheet: The bidder's proposed equipment's technical parameter/specification shall be matching with the required parameter/specification by IIT Kanpur as per the Technical Datasheet for all major items as specified at Annexure-1 to 5 under Appendix-I

9. **The tenderer shall have to furnish an affidavit on non judicial stamp paper of Rs. 10.00 as under:**

"I/We undertake and confirm that eligible similar work(s) has /have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the light, then I/We shall be debarred for tendering in IIT Kanpur contracts in future forever. Also, if such a violation comes to light before date start of work, the Superintending Engineer shall be free to forfeit the entire amount of Earnest Money Deposit / Performance Guarantee."

10. **INTEGRITY PACT**

The contractor shall download the Integrity Pact, which is a part of tender document, affix his signature & seal in the presence of a witness and upload the same while submitting the online bids. In absence of duly signed integrity pact the bids shall not be considered for technical evaluation.

Eligible bidders must also satisfy the following conditions and ensure submission of all documents mentioned in 2.3.

1. **Legal:** Unregistered Partnership Firm and Joint Venture or Consortium are not eligible.
2. **Registration:** Bidder should be registered with the Income Tax Department, Employees Provident Fund (EPF) Organization, Employees State Insurance (ESI) Corporation & GST. Bidders are not eligible in absence of these documents.
3. **Office:**

   Bidders have to establish its local accessible office at IIT Kanpur registered with local GSTIN to run the awarded work.

4 Bid Evaluation

The following process will be followed for the Technical and Financial Bids Evaluation:

4.1 Technical Bid Evaluation

- Technical bids received complete in all respects covering the entire scope of work, will only be opened
- The technical bid evaluation is done only for bidders who satisfy the minimum criteria by submitting documentary proof supporting eligibility criteria and the bids of agencies who have not submitted these documents are liable to be rejected without notice.

4.2 Financial Bid Evaluation

For financial bids, the following points shall be followed:

- After evaluation of Pre-eligibility conditions, a list of short listed agencies will be prepared.
- Thereafter the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of the qualified bidders or their representatives, if present.
- The bid shall remain valid for Ninety (90) days from date of opening of eligibility bids/Technical bid.

NOTE

The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:

- Amend the scope and value of contract to the bidder.
- Reject any or all the applications without assigning any reason.

Any effort on the part of the bidder or his agent to exercise influence or to pressurize the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

5 Various Forms and Formats

5.1 Undertaking regarding obtaining GST registration

Proforma for Undertaking regarding obtaining GST registration Certificate of The State in which work is to be taken up

(Undertaking to be furnished on a 'Non-Judicial' stamp paper worth Rs.100/) (Scanned copy of this notarized undertaking to be uploaded at the time of submission of bid, if required)

If work is awarded to me, I/we shall obtain GST registration Certificate of the State, in which work is to be taken up within one month from the date of receipt of award letter or before release of any payment by IITK, whichever is earlier, failing which I/We shall be responsible for any delay in payments which will be due towards me/us on a/c of the work executed and/or for any action taken by IITK or GST department in this regard.

.....
(Signature of Bidder(s))

Or

.....
(An authorized Officer of the firm with stamp)

.....
(Signature of Notary with seal)

5.2 Affidavit for not being blacklisted/debarred/restrained

Proforma for AFFIDAVIT for not being blacklisted/debarred/restrained

(AFFIDAVIT to be submitted on a 'Non-Judicial' stamp paper worth Rs.100/) (Scanned copy of this notarized affidavit to be uploaded at the time of submission of bid)

I/we undertake and confirm that our firm/partnership firm has not been blacklisted and/or debarred/restrained by ny Central Govt./ State Govt. Agency/ Autonomous body of the Central or State govt./ PSU etc. Further that, if such information comes to the notice of the Institute, then I/we shall be debarred for bidding in the Institute in future forever. Also, if such information comes to the notice of the Institute on any day before date of start of work, the competent authority shall be free to cancel the agreement and to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

.....
(Signature of Bidder(s))

Or

.....
(An authorized Officer of the firm with stamp)

.....
(Signature of Notary with seal)

5.3 Financial Information

Proforma for providing Financial Information

(Scanned copy of the completed information sheet to be uploaded at the time of submission of bid)

Financial Analysis: Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last three financial years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached).

Financial Years	2021-22	2022-23	2023-24
Gross Annual turnover			
Profit/Loss			

Signature of Chartered Accountant
……
Name of Chartered Accountant
……
Membership No. ICAI
Date and Seal

.....
Signature of the bidders(s)

5.4 Banker's Certificate from a scheduled Bank

Proforma of Banker's Certificate from a Scheduled Bank

(To be printed in Bank's Letterhead)

(Scanned copy of the Certificate to be uploaded at the time of submission of bid)

This is to certify that to the best of our knowledge and information that M/s. /Sh.....

having marginally noted address, a customer of our bank are/is respectable and can be treated

as good for any engagement up to a limit of Rs ..... (Rupees .....). This certificate is

issued without any guarantee or responsibility on the bank or any of the officers.

.....

(Signature for the Bank)

NOTE:

1. Bankers certificates should be on letter head of the Bank, addressed to tendering authority.
2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

5.5 Net Worth Certificate by certified Chartered Accountant

Proforma of Net Worth Certificate by certified Chartered Accountant
(To be printed in Letterhead of Chartered Accountant)
(Scanned copy of the Certificate to be uploaded at the time of submission of bid)

This is to certify that as per the audited Balance Sheet and Profit & Loss state- ment of the account during the financial year ....., the net worth of M/s./Sh.....(Name & Registered Address of individual/firm/company) as on 31.3.2024 is Rs. (Rupees. .....) after considering all liabilities.. It is further certified that the net worth of the company has not eroded by more than 30% in the last three years ending on 31.3.2024.

.....
(Signature of the Chartered Accountant)

.....
(Name of the Chartered Accountant)

.....
(Membership No. of ICAI)

.....
(Date & Seal)

5.6 Performance report on work executed

Proforma of Performance report on works referred to in Financial Information

(To be printed in Company's Letterhead)

(Scanned copy of the Performance Reports to be uploaded at the time of submission of bid)

1. Name of work/project & location:
2. Agreement no.:
3. Estimated cost:
4. Tendered cost:
5. Date of start:
6. Date of completion:
7. Stipulated date of completion:
8. Actual date of completion:
9. Amount of compensation levied for delayed completion, if any:
10. Amount of reduced rate items, if any:
11. Performance Report:

    (a) Quality of work: Outstanding / Very Good / Good /Poor

    (b) Technical Proficiency: Outstanding / Very Good / Good /Poor

    (c) Resourcefulness: Outstanding / Very Good / Good /Poor

    (d) General Behavior: Outstanding / Very Good / Good /Poor

Date: Signature of Superintending Engineer or Equivalent

5.7 Structure and Organization of the Agency

Proforma of providing Structure and Organization of the Bidding Agency

(To be printed in Company's Letterhead)

(Scanned copy of the Structure and Organization Document to be uploaded at the time of submission of bid)

1. Name & address of the bidder:
2. Telephone no./Telex no./Fax no.:
3. Email address for Communication:
4. Legal status of the bidder (attach copies of original document defining the legal status):
   (a) An Individual:
   (b) A proprietary firm:
   (c) A firm in partnership:
   (d) A limited company or Corporation:
5. Particulars of registration with various Government Bodies (attach attested photocopy)

   Organization / Place of registration, Registration No.

   1.
   2.
   3.
6. Names and titles of Directors & Officers with designation to be concerned with this work.
7. Designation of individuals authorized to act for the organization
8. Has the bidder, or any constituent partner in case of partnership firm, ever been convicted by the court of law? If so, give details.
9. Any other information considered necessary but not included above.

(Signature of of Bidder(s))

5.8 Declaration on Details of the Bidders

Proforma of Declaration on Details of the Bidders

(To be printed in Company's Letterhead)

(Scanned copy of the Performance Reports to be uploaded at the time of submission of bid)

DECLARATION

I/We, hereby declare that all the information and data furnished by our organization with regard to this tender specification are true and complete to the best of our knowledge. I/we have gone through the specification, conditions and stipulations in details and agree to comply with the requirements and intent of specification.

Particulars of the bidder as per following details:

1	Name of the firm / organization	:	
2	Type of the firm / organization: Public Ltd. / Private Ltd. / Registered firm	:	
3	Registered address	:	
4	Address of office	:	
5	Contact people	:	
6	Name & Designation	:	
7	Landline & Mobile numbers	:	
8	E-mail IDs	:	
9	PAN No.	:	
10	GST No.	:	
11	EPFO Reg. No.	:	
12	ESIC Reg. No.	:	
13	Annual Turnover for the last 3 years (Enclose copies of audited balance sheet and P&L A/c.)		
13.1	2023-2024	:	
13.2	2022-2023	:	
13.3	2021-2022	:	
14	Copy of EMD receipt with signature	:	
15	Has the applicant ever been required to suspend any project for a period of more than six months continuously after Commencement of work?	:	If so, give the name of the project and reasons of suspension of pro- ject

16	Has the applicant ever been convicted by a court of law?	:	YES / NO ,If yes, give details of the case
17	Details of any litigation in which the applicant is/was involved.	:	
18	All forms submitted as desired in the bid	:	Yes / No
19	Undertaking regarding subletting of work	:	

We further declare that our organization has not been blacklisted /delisted or put to any holiday by any Institutional agency / Govt. Department / Public Sector Undertaking in the last three years.

Date: Signature of Bidder(s) with seal

5.9 Details of Similar Nature of Works Completed by Agency

Proforma for submission of Details of Eligible Similar Nature of Works Completed* during the Last Seven Years ending previous day of the last date of submission of tenders

Sl. No.	Name of work/project and location	Owner or sponsoring organization	Cost of work in crores of Rupees	Date of commencement as per contract	Stipulated date of completion	Actual date of completion	Litigation/ arbitration cases pending/in progress with	Name and address/telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

*Indicate gross amount claimed and amount awarded by the Arbitrator.

Date: Signature(s) of with seal of bidder

5.10 Declaration About Site Inspection

Declaration about Site Inspection

(By Bidder)

To

The Superintending Engineer

Subject: Submission of Tender for the work of "**Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur"**

Dear Sir/Madam,

It is hereby declared that as per terms and conditions of this tender document, I/ We the bidder inspected and examined the subject site and its surrounding and satisfy myself / ourselves as to the nature of the ground and sub-soil (so far as is practicable), the forms and nature of the site./ ourselves before submitting the bid, the accommodation which may require and all necessary information as to risks, contingencies and other circumstances which may influence or affect our bid have been obtained. I/We the bidder shall have full knowledge of the site and no extra charge consequent upon any misunderstanding or otherwise shall be claimed in later date. I /We bidder shall be responsible for arranging and maintaining at own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by me/us implies that I / We have read this notice and all other contract documents and has made myself /ourselves aware of the scope and specifications of the work to be done and local conditions and other factors having a bearing on the execution of the work.

Sincerely

(Duly authorized signatory of the Bidder)

5.11 Letter of Transmittal

To

The Superintending Engineer
Indian Institute of Technology Kanpur Kanpur,
UP - 208016

Name of Work: **Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur.**

Dear Sir/Madam

Having examined details given in Notice and bid document for the above work, I/we hereby submit the relevant information.

1. I/We hereby certify that all the statements made and information supplied in the enclosed forms and accompanying statement are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/We also authorize the Superintending Engineer, Indian Institute of Technology Kanpur or his representative(s) to approach individuals, employers, firms and corporation to verify our competence, work experience, and general reputation.
4. I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following eligible completed works:

Sl. No.	Name of work	Amount	Certificate issued by
1.			
2.			
3.			
4.			

CERTIFICATE

It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I/We shall be liable to be debarred, disqualified/ cancelation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures:

Date of submission: Signature(s) of Bidder with seal

5.12 Tender Acceptance Letter

(To be given on Company Letter Head)

To,
Superintending Engineer
IIT Kanpur-208016

Sub: Acceptance of Terms & Conditions of Tender.

Tender Reference No: Date: .....

Name of Tender / Work: .....

Dear Sir,

5.12.1 I/ We have downloaded / obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely: as per your advertisement, given in the above mentioned website(s).

5.12.2 I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No..... to (including all documents like annexure(s), schedule(s), etc .,), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions / clauses contained therein.

5.12.3 The corrigendum(s) issued from time to time by your department/ organization too have also been taken into consideration, while submitting this acceptance letter.

5.12.4 I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

5.12.5 I / We do hereby declare that our Firm has not been blacklisted/ debarred/ terminated/ banned by any Govt. Department/Public sector undertaking.

5.12.6 I / We certify that all information furnished by our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/ organization shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

(Signature of the Bidder, with Official Seal)

5.13 Certificate for Tender

(To be given on Company Letter Head)

Date: .....

To,
Superintending
Engineer
IIT Kanpur-208016

Sub: Certificate of compliance as per Rule 144 (xi)

GFR's 2017 Tender Reference No:

.....

Name of Tender / Work: .....

1. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"
2. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all the requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

(Signature of the Bidder, with Official Seal)

Yours Faithfully,

5.14 CPWD-7

CPWD-7

PERCENTAGE RATE TENDER & CONTRACT FOR WORKS

Tender for the "**Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur** "

1. To be uploaded as per details uploaded in CPP portal at www.eprocure.gov
2. To be opened in the presence of tenderers who may be present at the time of opening in the Office of Superintending Engineer, IIT Kanpur.
3. The pre-qualification/Technical bid shall be opened first on due date and time as mentioned above. The time and date of opening of financial bid of contractors qualifying the technical bid shall be communicated to them at a later date.

TENDER

((To be signed in Company's Letterhead)

I/We have read and examined the notice inviting tender, schedule, A, B, C, D, E & F Specifications applicable, Drawings & Designs, General Rules and Directions, General Conditions of Contract (For construction works) 2023, CPWD SOP 2024 corrected up to the last date of bid submission, CPWD works manual 2024 corrected up to the last date of bid submission and clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Board of Governors within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for Ninety (90) days from the due date of its opening and not to make any modification in its terms and conditions.

A sum of **Rs. 40,24,193**/- is here by forwarded in receipt treasury challan/ Deposit as call receipt of a scheduled bank / Fixed deposit receipt of scheduled bank/ Demand draft of a scheduled bank/ bank guarantee issued by scheduled bank as earnest money deposit. If I/we, fail to furnish the prescribed performance guarantee or fail to commence the work within prescribed period, I/ we agree that the said Board of Governors, IIT Kanpur or his successors in office shall without prejudice to any other right or remedy to be at liberty to forfeit the said earnest money absolutely. Further, if I/we fail of commence the work as specified , I/we agree that Board of Governors , IIT Kanpur or his successor in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to the tender documents upon the terms & condition contained or referred to therein and to carry out such deviations as may be ordered, up to maximum of the percentage mentioned in schedule '"F" and those in excess of that limit at the rates to be determined in accordance with the provision contained in clause 12.2 and 12.3 of the tender form.

Further, If I/we, withdraws tender or makes any modification in the terms & conditions of the tender which is not acceptable to the department after the last date of submission of bids, then the Institute shall without prejudice to any other right or remedy, be at liberty to forfeit 100% of the earnest money absolutely

irrespective of letter of acceptance for the work is issued or not.

Further, I/we agree that in case of forfeiture of earnest money or both earnest money & performance guarantee as aforesaid, I/we shall be debarred for participation in the retendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back-to-back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in Indian Institute of Technology Kanpur in future forever. Also, if such a violation comes to the notice of Indian Institute of Technology Kanpur before date of start of work, the Superintending Engineer shall be free to forfeit the entire amount of Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate informa- tion/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety & integrity of IIT Kanpur

Date: Signature(s) of Contractor(s) with seal

Address:

Occupation:

5.15 Technical Data sheet of 10MVA, 33/11 kV power transformer

Sr. No.	Specifications	As per Requirement	Bidders Offer/ Compliance
1	Make	As per tender approved makes	
2	Defect liability period	Two-years	
3	Rated MVA (ONAN rating)	10 MVA	
4	Type	Outdoor power transformer, oil immersed, Energy efficient (Level-2) with auto OLTC	
5	No. of phases	3	
6	Frequency	50 Hz (± 5%)	
7	Type of cooling	ONAN (Oil natural / Air natural)	
8	Rated voltage (HV/LV)	33 / 11 KV	
9	Rated current HV/LV	174.95 A/ 524.89 A	
10	No. of windings	Two	
11	Connection symbol / Vector Group	Dyn 11	
12	Percentage impedance voltage on normal tap and MVA base at 75 degree C corresponding to HV/ LV rating	MVA Rating- 10MVA	
		% Impedance- 8.35	
13	Type of tap changer	Auto On -load Tap Changer. (OLTC)	
14	Range of taping	+ 5% to – 15% in 8 equal steps of 2.5% each on HV winding, or alternatively, on HV winding for HV variation, to give normal 11 KV on LV side.	
15	Insulation levels fo r windings: -	33 /11 KV	
	a) Lighting Impulse withstand (KVP)	33KV - 170KVP 11KV-75KVP	
	(b) Power frequency voltage withstand (KVrms)	33KV-70KVrms 11KV-28Kvrm	
16	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1.	
17	Permissible Temperature Rise over ambient temperature of 40 / 45˚C		
	a) Temp. of top oil measured by thermometer.	40˚C	
	b) Temp. of winding measured by resistance	45˚C	
18	Terminals		
	a) HV winding line end	36 KV oil filled communicating type porcelain bushing (Anti fog type)	

	b) LV Winding	12 KV porcelain type of busing (Anti fog type) for outdoor 11 KV	
19	Performance figures@10 MVA base		
	a) No load loss KW (Max)	7	
	b) Load loss, KW (Max)	50	
	c) Auxillary loss, kW	0	
	d) Impedance % Min @ 10 MVA base	8.35	
21	% Efficiency @75 deg C/Unity P.F.		
	a) at 100% load	99.43	
	b) at 75% load	99.53	
	c) at 50% load	99.61	
22	% Efficiency @75 deg C/0.8 P.F.		
	a) at 100% load	99.29	
	b) at 75% load	99.42	
	c) at 50% load	99.51	
23	%Regulation at Full load		
	a) Unity P.F.	0.85	
	b) at 0.8 P.F.	5.6	

5.16 Technical Data sheet of 2.5MVA, 11/0.433 KV Dry type Distribution Transformer

Sr. No.	Specifications	As per Requirement	Bidders Offer/ Compliance
1	Make	As per tender approved makes	
2	Defect Liability Period	Two-years	
3	Rated MVA (AN rating)	2.5 MVA	
4	Reference Standard	IS :11171	
4	Type	Dry Core type, Step Down indoor distribution transformer with Auto OLTC	
5	No. of phases	3	
6	Frequency	50 Hz (± 5%)	
7	Type of cooling	AN (Air Natural)	
8	Rated voltage (HV/LV)	11 /0.433 KV	
9	Rated current HV/LV	131.22A/ 3335.43A	
10	No. of windings	Two	
11	MVA Rating corresponding to AN Cooling system	100%	
12	Vector Group	Dyn 11	
13	% Impedance	6.25	
14	Type of tap changer	Auto ON Load Tap Changer. (OLTC)	
17	Over Voltage operating capability and duration	110 % of rated voltage (continuous) 125% for at-least five Minute 140% for at-least one minute	
18	Insulation levels for windings: -	11/0.433 KV	
	(a)1.2 / 50 microsecond wave shape Impulse withstand (KVP)	11KV - 75KVP	
		0.433KV-28KVP	
	(b) Power frequency voltage withstand (KVrms)	11KV-28KVrms 0.433KV-3Kvrm	
19	Withstand time for three phase short circuit	3 Seconds	
20	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1.	
21	Permissible Temperature Rise over ambient temperature of 50 C		
	1. Winding temp. measured by resistance	45 C	
22	Insulation level of bushing		
	a) HV/LV	HV=17.5KV/250A LV=1.1Kv/5000A	
	2. Terminal Arrangement (HV/LV)	Cable Box / Busduct	
27	aterial of HV & LV conductor	Electrolytic Copper	
28	aximum current density for HV and LV winding for rated current	2.4 A/mm2	

29	Performance figures a) Total loss @50% load kW (Max) b) Total loss @100 load kW (Max)	As per ECBC Standards	
	C) Impedance in % (IS Tol.)	6.25	
30	%Efficiency at 75 deg c/ Unity P.F 1. At 100% load 2. At 75% load 3. At 50% load 4. At 25% load	As per ECBC Standards	
31	%Efficiency at 75 deg C/0.8 P.F. A)At 100% load b)At 75% load c) At 50% load d) At 25% load	As per ECBC Standards	
32	Maximum efficiency at unity P.F	As per ECBC Standards	
33	Load at which max. efficiency at unity P.F. occurs	As per ECBC Standards	
34	% Regulation at full load a) Unity P.F b) At 0.8 P.F	As per ECBC Standards	
40	Transformer overloading	As per IEC 60076 Part 10	

5.17

Technical Data sheet of 1.6MVA, 11/0.433 KV Dry type Distribution Transformer

Sr. No.	Specifications	As per Requirement	Bidders Offer/ Compliance
1	Make	As per tender approved makes	
2	Defect Liability Period	Two-years	
3	Rated MVA (AN rating)	1.6 MVA	
	Reference Standard	IS:11171	
	Type	Dry, Core type, Step Down indoor distribution transformer with Auto OLTC,	
4	No. of phases	3	
6	Frequency	50 Hz (± 5%)	
7	Type of cooling	AN (Air Natural)	
8	Rated voltage (HV/LV)	11 /0.433 KV	
9	Rated current HV/LV	83.98A/ 2134.58A	
10	No. of windings	Two	
11	MVA Rating corresponding to AN Cooling system	100%	
12	Vector Group	Dyn 11	
19	Percentage impedance voltage on normal tap and MVA base at 75o C corresponding to HV/ LV rating	MVA Rating- 1.6 MVA % Impedance- 6.25	
	Type of tap changer	Auto ON Load Tap Changer. (OLTC)	
21	Over Voltage operating capability and duration	110 % of rated voltage (continuous) 125% for at-least five Minute 140% for at-least one minute	
22	Insulation levels for windings: -	11/0.433 KV	
	(a)1.2 / 50 microsecond wave shape Impulse withstand (KVP)	11KV - 75KVP	
		0.433KV-28KVP	
	(b) Power frequency voltage withstand (KVrms)	11KV-28KVrms	
		0.433KV-3Kvrm	
23	Withstand time for three phase short circuit	3 Seconds	
24	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1.	
25	Permissible Temperature Rise over ambient temperature of 50 C		
	3. Winding temp. measured by resistance	45 C	
26	Insulation level of bushing		
	a) HV/LV	HV=17.5KV/250A	
		LV=1.1Kv/4000A	
	b) Terminal Arrangement(HV/LV)	Cable Box / Busduct	
27	aterial of HV & LV conductor	Electrolytic Copper	

28	Maximum current density for HV and LV winding for rated current	2.4 A/mm2	
	Performance figures c) Total loss @50% load kW (Max) d) Total loss @100 load kW (Max)	As per ECBC standards	
	C) Impedance in % (IS Tol.)	6.25	
30	%Efficiency at 75 deg c/ Unity P.F 5. At 100% load 6. At 75% load 7. At 50% load 8. At 25% load	As per ECBC standards	
31	%Efficiency at 75 deg C/0.8 P.F. A)At 100% load b)At 75% load c) At 50% load d) At 25% load	As per ECBC standards	
32	Maximum efficiency at unity P.F	As per ECBC standards	
33	Load at which max. efficiency at unity P.F. occurs	As per ECBC standards	
34	% Regulation at full load c) Unity P.F d) At 0.8 P.F	As per ECBC standards	
40	Transformer overloading	As per IEC 60076 part 10	

5.18

Technical Data sheet of 0.630MVA, 11/0.433 KV Dry type Distribution Transformer

Sr. No.	Specifications	As per Requirement	Bidders Offer/ Compliance
1	Make	As per tender approved makes	
2	Defect Liability Period	Two-yeas	
3	Rated MVA (AN rating)	0.630 MVA	
	Reference Standard	IS:11171	
	Type	Dry core type, Step Down indoor distribution transformer, with Auto OLTC	
4	No. of phases	3	
6	Frequency	50 Hz (± 5%)	
7	Type of cooling	AN (Air Natural)	
8	Rated voltage (HV/LV)	11 /0.433 KV	
9	Rated current HV/LV	33.06A/ 840.49A	
10	No. of windings	Two	
11	MVA Rating corresponding to AN Cooling system	100%	
12	Vector Group	Dyn 11	
19	% Impedance	- 6.25	
	Type of tap changer	Auto ON Load Tap Changer. (OLTC)	
21	Over Voltage operating capability and duration	110 % of rated voltage (continuous) 125% for at-least five Minute 140% for at-least one minute	
22	Insulation levels for windings: -	11/0.433 KV	
	a)1.2 / 50 microsecond wave shape Impulse withstand (KVP)	11KV - 75KVP	
		0.433KV-28KVP	
	(b) Power frequency voltage withstand (KVrms)	11KV-28KVrms	
		0.433KV-3Kvrm	
23	Withstand time for three phase short circuit	3 Seconds	
24	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1.	
25	Permissible Temperature Rise over ambient temperature of 50 C		
	1. Winding temp. measured by resistance	45 C	
26	Insulation level of bushing		
	Terminal Arrangement(HV/LV)	Cable Box / Busduct	
	b) HV	HV=17.5KV/150A LV=1.1Kv/2000A	
27	aterial of HV & LV conductor	Electrolytic Copper	
28	aximum current density for HV and LV winding for rated current	2.4 A/mm2	

	Performance figures e) Total loss @50% load kW (Max) f) Total loss @100 load kW (Max)	As per ECBC Standards	
	C) Impedance in % (IS Tol.)	6.25	
30	%Efficiency at 75 deg c/ Unity P.F 9. At 100% load 10. At 75% load 11. At 50% load 12. At 25% load	As per ECBC Standards	
31	%Efficiency at 75 deg C/0.8 P.F. A)At 100% load b)At 75% load c) At 50% load d) At 25% load	As per ECBC Standards	
32	Maximum efficiency at unity P.F	As per ECBC Standards	
33	Load at which max. efficiency at unity P.F. occurs	As per ECBC Standards	
34	% Regulation at full load e) Unity P.F f) At 0.8 P.F	As per ECBC Standards	
40	Transformer overloading	As per IEC 60076 part 10	

5.19

Technical Datasheet of 1010 kVA DG Sets

Sr. No.	Specifications	As per Requirement	Bidders Offer/ Compliance
1	**DG Set Capacity**	**1010 KVA**	
i)	Make	As per tender approved makes	
ii)	Defect Lability period of complete unit	Two year	
iii)	Prime Power factor	0.8 as per ISO 8528 with acoustic enclosure as per CPCB norms	
iv)	CC/RCC Foundation for DG set	As per specifications / OEM recommendations	
v)	Acoustic Enclosure	Designed & Manufactured by DG Set OEM, As per CPCB-latest Norms	
vi)	**Exhaust Chimney**	MS Stack structure for exhaust pipe with hospital grade silencer.	
vii)	**Anti-Vibration pad**	Anti-Vibration pad	
viii)	**Voltage regulation**	± 1 %	
ix)	**First fill of fuel (Diesel)**	500 Ltrs. or higher	
2	**Engine**		
I	Make	Kirloskar / Cummins/Greaves Cotton/Baudouin/ Caterpillar/Perkins	
Ii	**Specification**	Turbocharged Diesel Engine 4 stroke as per ISO 8528 at 1500 RPM	
Iii	**Fuel tank capacity**	Fuel tank capacity 990 Ltrs or Above	
iv	**Confirmation to codes**	Engine shall be confirm to IS 10000/ISO 3046/ BS 649/ BS 5514 amended upto date	
iv	**Silencer**	Hospital grade silencer	
3	**Alternator**		
I	Make	**Stamford/ Crompton Greaves/ Kirloskar/Leroy Somer**	
Ii	Specification 1	Synchronous alternator rated 1010 KVA at 1500 RPM 3 phase, 415V 50 Hz, AC supply with 0.8 PF lagging at site condition.	
Iii	Specification 2	Alternator have SPDP enclosure (IP 23).	
iv	Codes	Alternator complete in all respect as per IS 4722 & IEC 34	

6 Proforma of Schedules

PROFORMA OF SCHEDULES

6.1 SCHEDULE 'A': Schedule of Quantities

Schedule of Quantities : BOQ uploaded separately

6.2 SCHEDULE 'B': Schedule of materials to be issued to the contractor

Schedule of materials to be issued to the contractor: NIL

6.3 SCHEDULE 'C': Tools and plants to be hired to the contractor

Tools and plants to be hired to the contractor: NIL

6.4 SCHEDULE 'D': Extra schedule for specific requirements/document for the work, if any

Extra schedule for specific requirements/document for the work, if any: NIL

6.5 SCHEDULE 'E': Reference to General Conditions of Contract

Reference to General Conditions of Contract	:	General Conditions of Contract 2023 for Construction Works & Maintenance work and as amended / modified up to the last date of sub- mission of Bid.
Name of Work	:	Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur.
Total Estimated cost of work	:	Rs. 30,24,19,266/-
Earnest Money	:	Rs. 40,24,193/-
Performance Guarantee	:	5% of tendered value
Security Deposit	:	2.5% of tendered value will be deducted from each bill. Same would be released after successful completion of Two year defect liability period and as per special conditions of the contract.

6.6 SCHEDULE 'F': General Rules and Directions

GENERAL RULES & DIRECTIONS:

Officer Inviting tender: Superintending Engineer

6.6.1 Definitions

1. Inviting Authority	:	Superintending Engineer
2. Engineer-in-Charge	:	Executive Engineer
3. Accepting Authority	:	B&WC
4. Percentage on cost of materials and Labour to cover all overheads and profits	:	15%
5. Standard Schedule of Rates	:	For Electrical Work: DSR (E&M), 2023 & MR with up-to-date correc- tion slip
6. Department	:	Institute Works Department, IIT Kanpur
7. Standard CPWD Contract Form	:	General Conditions of Contract 2023, SOPs 2024, CPWD Works manual 2024, CPWD Form 7 as amended / modified up to the last date of submission of Bid. The following condition pertains to GST of clause 37 & 38 of General Condition of contract and corresponding Amendments should be read as fol lows: a- The Quoted rates should be exclusive of GST. b- The GST as applicable shall be paid extra.

6.6.2 Clauses

Clause 1		
i. Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and ap- plicable labour licenses, registration with EPFO, ESIC and BOCW wel- fare board or proof of applying thereof from the date of issue of the letter of acceptance	:	**7 days**

ii. Maximum allowable extension with late fee @ 0.1% per day of Per- formance Guarantee amount beyond the Period provided in (i) above	:	**7 days**
Clause 1A	:	**Applicable. The Defect liability period shall be Two year from the date of handing over of the assigned works to the user/Institute**
Clause 2		
Authority for fixing compensation under Clause 2	:	DOIP, IIT Kanpur
Clause 2 Whether Clause 2 shall be applic- able	:	YES
Clause 5	:	
(i): Number of days from the date of issue of letter of acceptance for reckoning date of start	:	7 Days
ii: Milestones	:	Time allowed for execution of work along with the amount to be withheld in case of non-achievement of milestone are shown in Table 6
Clause 6: Computerized Measurement Bill	:	*Applicable*
Clause 7 Gross work to be done together with net payment/Adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment	:	Not Applicable
Clause 7A	:	Applicable
Clause 10A	:	Applicable
Clause 10B (i)	:	Applicable
Clause 10B (ii)	:	Not Applicable
Clause 10B (iii)	:	Not Applicable
Clause 10C	:	*Not Applicable*
Clause 10CA	:	*Not Applicable*
Clause 10CC	:	Not applicable

Clause 11	:	CPWD Specification Vol. I-2023, II-2023 & IV-2013, and latest CPWD specifications of all E&M items, with correction Slips issued up to the last date of receipt of tenders (herein called CPWD Specifications also) and as per NIT for E&M works. Specifications to be followed for execution of Civil work and E&M works
Clause 12: Type of work	:	Original Work
Clause 12.2 & 12.3: Deviation limit beyond which clause 12.2 & 12.3 shall apply for Building work	:	Applicable
Clause 16 Competent Authority for deciding reduced rates: For Civil items and For Electrical items of work	:	As per Table 7
Clause 17 - Defect liability period completion of contract whichever is later		
Clause 18 - List of mandatory machinery, tools & plants to be deployed by the contractor at site	:	Two year and those listed in Special Conditions of Contract DOI
Clause 32 - Requirement of Technical Representative(s)	:	As per the scope of the work
	:	As per Table 9

If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited.

Table 6 : Milestone chart

Sl. No.	Description of mile stone	Period for completion from date of start	Withheld amount for non achievement of mile stone.
1	Substation Layout , SLD and other shop/GFC drawings submission by contractor	2 months	1 % of the accepted tendered value
2	Technical data sheet submission of equipments i.e. Transformer, HT panel, cables, DG sets, Sync. Panel, VCB, CT, PT, ISO etc.		
3	Submission of cable schedule by contractor		
4	Building internal electrification start work		
5	33 KV & 11 KV cable delivery	4 months	0.5 % of the accepted tendered value
6	33 KV & 11 KV cable laying completion		
8	Construction of 33 KV bays, and equipment foundations		
	Delivery of Transformer, VCB and HT Panels etc	8 months	1 % of the accepted tendered value
9	Installation of transformer		
10	Installation of HT switchgear		
11	Foundation of DG sets		
12	Delivery of DG sets		
13	Installation of DG sets		
14	Commissioning of Transformers and 33/11 KV SS	12 months	0.5 % of the accepted tendered value
15	Commissioning of 11/.433 KV SS		
16	Commissioning of DG sets		
17	Commissioning of RTU and SCADA integration		

Table 7: Authority to decide

(i)	Extension of time (EOT)	:	DOIP
(ii)	Rescheduling of milestones	:	Superintending Engineer, IIT Kanpur
(iii)	Shifting of date of start in case of delay in handing over of site	:	Superintending Engineer, IIT Kanpur

Table 8: Materials for which all India Wholesale Price Index to be followed Nearest

Sl.No	Material covered under this clause Portland Pozzolana	Materials (other than cement, reinforcement bars and the structural steel) for which All India Wholesale Price Index to be followed	Base Price (without GST) of Materials, covered under clause 10 CA
1	Cement (PPC)/ Ordinary Pozzolana Cement	Nil	Nil
2	Steel for Reinforcement TMT Fe 500D Primary Manufacturer	 Nil Nil	
3	Structural Steel (Primary producers)	Nil	

Table 9: Requirement of Technical staff, Clause 32						
Sl No.	**Requirement of Technical staff *Qualification* (Of Major + Minor component)**	***Number***	**Minimum experience in Year**	**Minimum experience in Year**	**Rate at which recovery shall be made from the contractor in the event of not fulfilling provision <u>of Clause 32</u>**	
					Figures	**Words**
1	Graduate Engineer (Electrical)	1	20	Project Manager	Rs. 60000/- PM	Rs. Sixty Thousand Only.
2	Graduate Engineer (Electrical)	1	12	Project Manager	Rs. 25000/- PM	Rs. Twenty- Five Thousand Only
3	Diploma Engineer	2	5 & 10	Project Planning/ quality/ billing Engineer (Electrical/Mechanical)	Rs. 15,000/- pm per month per person	Rs. Fifteen Thousand only per month per person

Note 2: Project/Site Engineer for Electrical work mentioned must be required from the beginning of the work electrical work has to happen in a coordinated manner to meet the date of handover of site as per special terms and conditions.

7. Scope of work

7.1 Project Brief

1. Construction of New 33/11 kV substation & interconnection of existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur as specified in BOQ.

Note: The scope of the works listed above is indicative only. For the details of the works, please refer to the BOQ and the work has to be done strictly as per the specifications in the BOQ.

8 Specifications for Electrical Works

8.1 Specifications Medium Voltage Switchgear

1. STANDARDS AND CODES

The following Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Govern- ment regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

Low voltage Switchgear and Control gear specifications IS 13947 : 1993 Part I –

General

Part 2 – Circuit Breakers Part 3 –

Switch Fuse Units

Part 4 – Contactors and Motor Starters Part 5 –

Control Circuit Devices

Electrical Relays for power system protection IS 3231 : 1986

Low voltage Switchgear and Controlgear assemblies IS 8623 : 1993 Marking of

Switchgear busbars IS 11353 : 1985

Degree of Protection of Enclosures for low voltage

switchgear IS 2147 : 1962

Code of Practice for selection, installation and maintenance

of Switchgear IS 10118 : 1982

2. SWITCH FUSE UNITS

2.1 Switch fuse units, incorporated in switchboards wherever required shall conform in all respects to IS 13947 : 1993. Switch fuse units shall be suitable for 415 Volts 3 Phase 50 HZ AC supply and shall be suitable for AC - 23 A duty.

Unit housing shall be of robust construction designed to withstand ardous conditions. Sheet steel used shall be given rigorous rust proofing treatment before fabrication and painting Units shall have double break per phase in order to isolate fuse links when the switch is in OFF position.

Operating mechanism of units shall be crisp and positive in action with quick- make and quick-break silver plated contacts. Operating handle shall be suitable for rotary operation unless otherwise specified. Position of handle such as ON and OFF shall be clearly indicated.

All live parts inside the switch fuse units shall be shrouded to prevent any accidental contact.

All the terminals shall be liberally designed. All units above 100 A shall be provided with integral cable sockets.

All switch units shall be provided with suitable interlocks such that the door of the switchboard panel shall not open unless the switch is in OFF position. Provision for padlocking the switch in OFF position shall also be provided.

Routine and type tests as per IS 13947: 1993 shall be conducted at works and test certificates furnished.

3. MOULDED CASE CIRCUIT BREAKERS

i) Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

ii) MCCB cover and case shall be made of high strength heat resisting and flame retard- ant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal/magnetic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Thermal/magnetic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

iii) Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

iv) MCCBs shall be provided with following accessories, if specified in draw- ings/schedule of quantities :

- Under voltage trip
- Shunt trip
- Alarm switch
- Auxiliary switch

v) MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position

- Deinterlocking device to open the door even if the breaker is in ON position. MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

4. METERING, INSTRUMENTATION AND PROTECTION.

The switchboard shall have required current and potential transformers as per schedule of quantities for metering and protection. The transformers shall comply to relevant ISS and class of accuracy required for metering and protection. Separate sets of CTs shall be provided for metering and protection.

4.1 Current Transformers

C/Ts shall confirm to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class SP 10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

4.2 Potential Transformer

PTs shall confirm to IS 3156 (Part-I,II and III) in all respects.

4.3 Measuring Instruments

Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10$_0$ C and +50$_0$C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from outside. Direction of deflection shall be from left to right. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings

4.3.1 Ammeters

Ammeters shall be of moving iron type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufacture and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers. Ammeters shall

be capable of carrying substantial over loads during fault conditions.

4.3.2 Voltmeters

Voltmeters shall be moving iron type range of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection fuse.

4.3.3 Watt meter

Wattmeter shall be of 3 phase electro dynamic type and shall be provided with a maximum demand indicator if required.

4.3.4 Power factor meters

3 phase power factor meters shall be of electro dynamic type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% readings. Phase angle accuracy shall be $+4^0$.

4.3.5 Energy and reactive power meters

Trivector meters shall be two element, integrating type, KWH, KVA, KVARH meters. Meters shall confirm to IEC 170 in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy conception of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

4.4 Relays

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Engineer-in-Charge for approval.

4.4.1 Over current relays

Over current relays shall be induction type with inverse definite minimum time lag charac- teristics. Relays shall be provided with adjustable current and time settings. Setting for current shall be 50 to 200 % insteps of 25%. The IDMT relay shall have time lag (delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 Amps.

4.4.2 Earth fault relay

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

4.4.3 Under voltage relay

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

4.5 Power factor correction capacitors

Power factor correction capacitors shall conform to IS 2834 in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 5,10,15,20,25 and 50 kVAR sizes as per

requirements. Capacitor shall be usable for indoor use, permissible overloads being as below.

- Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
- Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
- Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitory unit shall be provided with its own built in silvered fuse. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnates The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

5. MEDIUM VOLTAGE SWITCH BOARDS

5.1 GENERAL

- All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, 415 volt, 50 Hz, neutral grounded at transformer system with a short circuit level withstand of 31 MVA at 415 volts or as per schedule of quantities.
- The Switch Boards shall comply with the latest edition with upto date amendments of relevant Indian Standards and Indian Electricity Rules and Regulations.

5.2 SWITCH BOARD CONFIGURATION

- The Switch Board shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the Schedule of Quantities.
- The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.
- The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

5.3 EQUIPMENT SPECIFICATIONS

All equipment used to configure the Switch Board shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical Specifications as included in this tender document.

5.4 CONSTRUCTIONAL FEATURES

- The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, dead front, floor mounting type and suitable for indoor mounting.
- The Switch Boards shall be totally enclosed, completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 42. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.
- The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints

of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
- Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

5.5 SWITCHBOARD DIMENSIONAL LIMITATIONS

- A base channel 75 mm x 5 mm thick shall be provided at the bottom.
- A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.
- The overall height of the Switch Board shall be limited to 2300 mm
- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1800 mm from finished floor level.

5.6 SWITCH BOARD COMPARTMENTALIZATION

The Switch Board shall be divided into distinct separate compartments comprising

- A completely enclosed ventilated dust and vermin proof bus bar compartment for the horizontal and vertical busbars.
- Each circuit breaker, and MCCB shall be housed in separate compartments enclosed on all sides.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker/switch fuse unit in "on" and "off" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accom- modating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
- A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
- Separate cable compartments running the height of the Switch Board in the case of front access Boards shall be provided for incoming and outgoing cables.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.
- Adequate and proper support shall be provided in cable compartments to support cables.

Following minimum clearances to be maintained after taking into consideration connecting bolts, clamps etc.

i) Between phases 32 mm

ii) Between phases and neutral 26 mm

iii) Between phases and earth 26 mm

vi) Between neutral and earth 26 mm

5.7 SWITCH BOARD BUS BARS

- The Bus Bar and interconnections shall be of electrolytic Copper/Aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar. The

maximum current density for copper shall be 1.2 amps per sq. mm. and for Aluminium shall be 0.8 amp per Sq. mm. and suitable to withstand the stresses of a 31 MVA fault level or at 415 volts for 1 second or as per schedule of quantities. .

- The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.
- The bus bars shall be extensible on either side of the Switch Board.
- The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second.
- All bus bars shall be colour coded.
- All bus bar connections in Switch Boards shall be bolted with brass bolts, washers and nuts.

5.8 SWITCH BOARD INTERCONNECTIONS

- All connections between the bus bars/Breakers/ shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.

5.9 DRAW-OUT FEATURES

Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

5.10 INSTRUMENT ACCOMMODATION

- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Com- partment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switch Board.
- For MCCB's instruments and indicating lamps can be provided on the compartment doors.
- The current transformers for metering and for protection shall be mounted on the solid copper/ aluminum bus bars with proper supports.

5.11 WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm.

5.12 CABLE TERMINATIONS

- The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.
- The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.
- The Switch Boards shall be complete with gland plates

5.13 SPACE HEATERS

The Switch Board shall have in each panel thermostatically controlled space heaters with a controlling 15 amp 230 volt switch socket outlet to eliminate condensation

5.14 EARTHING

A main earth bar of G.I shall be provided throughout the full length of the Switch Board with a

provision to make connections to earth stations on both sides.

5.15 SHEET STEEL TREATMENT AND PAINTING

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process or by using sand blasting method. The steel work shall then receive two costs of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.
- All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall be adequate.

5.16 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

6. INSTALLATION

The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switch Board installed. All bus bar connections shall be checked with a feeler gauge after installation. The able end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.

A 15 mm thick rubber matting of approved make on a 100 mm high timber platform shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

7. OUTDOOR TYPE DISTRIBUTION FEEDER PILLARS

The feeder pillar shall be of the floor mounting type, totally enclosed, and weather proof, conforming to ISI IP 54 incorporating phenolic moulded fuse fittings with high rupturing capacity cartridge fuse links having a certified rupturing capacity of not less than 35 MVA at 433 volts. The feeder pillar shall be suitable for 440 volts 3 phase 4 wires, 50 cycles AC supply.

The cubicle should be fabricated out of heavy gauge sheet steel of thickness not less than 2 mm thick with suitable side frame and stiffeners. Hinged doors of not less than 1.6 mm thick should be provided at the front and rear of the cubicle to provide access for installation, operation, tests and inspection. The rear door is provided to facilitate cable termination and the front door for inspection of fuses, to switch ‘ON’ and ‘OFF’ the switch as and when required. All doors should be fitted with dust excluding neoprene gaskets. The doors should also be fitted with suitable locking arrangement with lock to prevent unauthorized opening. The cubicle should be designed for mounting over cement concrete plinths by the roadside, and should be of substantial construction capable of withstanding the vibrations normally experienced due to vehicular traffic. The top of the feeder pillar is of slanting construction in all directions to prevent any collection of water due to rain. A gland plate is provided at the bottom of the feeder pillar (removable) for mounting the cable glands. The feeder pillar shall be fitted on an angle iron pedestal at the bottom covered with sheet metal from all the four sides which facilitates cable bending etc specially with aluminium cables. Two lifting hooks shall be provided at the top. A door switch shall be provided in the feeder pillar so as to switch ‘ON’ and ‘OFF’ the lamp fixed in the brass batten holder below the top sheet of the pillar.

The sheet steel materials used in the construction of the cubicle should have undergone a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulfuric acid solution and recognized

phosphating process. After metal treatment, the interior of the cubicle should be painted with two coats of air-drying red lead primer followed by two coats of air drying anti-condensation paint. The exterior of the cubicle should be painted with two coats of staving red oxide primer followed by one coats of epoxy finishing paint. One final spray of epoxy paint shall be applied at the time of handing over the installation.

All the nuts, bolts shall be cadmium plated with spring washers. A minimum spacing from cable connection to the bottom of gland plate shall be 300mm.

The bus bars should be of electrical grade copper. They should be air insulated with adequate clearances between conductors and between conductors and earth. These should be colour coded to enable immediate identification of the phases and neutral. The current density for bus bars shall not be more than 1.0 amps per square mm. All bus bar joints and tapings should be of the clamped type as far as possible thereby avoiding drilling of holes on bus bars. The bus bars should be carried on supports made out of a suitable non-inflammable and non-hygroscopic material such as Hylam, Permali or Formics. Suitable insulating phase barriers should be provided to prevent accidental short-circuits during operation.

The fuse base contacts should be of copper comprising one top contact for bolting to the bus bar, one bottom contact for terminating the incoming or outgoing cable and a cable lug. The bottom contacts should be so designed that the cable tail from the cable gland to the cable lug is vertical and does not foul with any live parts in its run. The spacing between the respective fuse bases should not be less than 40mm.

The fuse carriers should be fitted as standard to all fuses to minimize accidental contact with live metal during inspection or maintenance. The carriers should be phenolic moulded, designed

to accommodate HRC fuse-links and should incorporate a wedge action device for tightening the fuse-link to the base contact. This wedge action should be operated externally by insulated thumb screws giving uniformly high pressure contact ad ensuring cool running under full load conditions, with positive location of the fuse-link tags on the base contact. The fuse-link shall not work loose due to vibration occurring from vehicular traffic.

A viewing aperture should be provided on the carrier to facilitate location of a ‘blown’ fuse. The fuse carriers should also be easily withdrawable in service. The design of the carrier should be such that carrier components do not carry any current and the contact is decidedly between fuse-link tag and base contact.

When incoming links are called for it should be possible to fit the carriers with solid links in lieu of fuses.

Cable Trays, Racks, perforated and associated Material

Cable Trays / Support

1. All cable trays shall be ladder type and shall be supported and laid in accordance with the ‘layout drawings’.

2. Cable trays shall be ladder type and dip galvanized after fabrication.

3. Ca.ble tray supports shall be cantilever type for easy installation. All supports and hardware shall be hot dip galvanized.

4. Standard cable tray width shall be 600 mm. However reduced width of 300 mm shall be used in some place where specifically required.

5. Trays in general shall be supported at a distance of 1.5 m horizontal run.

6. All welds for cable trays shall have a minimum throat thickness of 60mm.

7. Jointing of cables trays shall be done by welding only.

8. Damaged galvanized surfaces shall be cleaned and coated with two (2) coats pf red oxide primer followed by two (2) coats of cold galvanized paint.

Earthing of cable Trays.

Cable trays shall be electrically continuous and grounded. Earthing of cable trays shall be ensured by separate connection with the weld.

Cable Tray Installation

All relevant layout drawings enclosed shall be followed except shaft obvious interference occurs. In such case the coating shall be damaged as directed and / approved by the owner.

Twenty (20%) spare space shall be provided in cable tray.

Cabling

Adequate space will be provided to facilitate installation of cable system and to allow routine inspection and modification after installation.

Different voltage grade cable shall be laid in separate trays when the tray are run in tier formation. Generally power cable will be on bottom trays and control cables system with non-inflammable materials.
Cables for redundant equipment / system shall be run in separate trays.

All opening in the floor and wall for cable access shall be sealed after installation of the cable system with non-inflammable materials.

Grounding

All grounding work shall be carried but as per guidelines specified in 'Grounding notes and details along with the typical grounding drawings enclosed with this specification.

Main grounding grid shall be laid 1 M below ground level. This shall be comprising of 40mm dia MS rod and earth pit. This earthing system will also be interconnected to the existing system.

Tapped riser of 50 x 6 mm 6.5 mtr from main grounding grid running along tray, building structural steel shall be used as ground continuity conductor.

Building structural steel wherever available shall be directly connected with main ground grid. In no case runner angle of cable tray, building structural steel shall be used as ground continuity conductor.

All equipment under this package shall be directly connected to main grounding grid/ ground continuity conductor running along cable tray.

The riser shall be bolt connection at equipment end. In case the rise length is not adequate, separate equipment ground conductor shall be used which will be welded to the riser at one end and bolt connector to the equipment at other end.

All ground conductor shall be painted black after connection to guard against weathering and easy identification.

Equipment ground connection after checked and tested by the Authority shall be coated with anti-

corrosive paint/ old compound.

All ground connection shall be made by electric arc welding unless otherwise specified.

Electrical equipment shall be provided with two separate and all sealed grounding pads, each complete with tapped hole galvanizing spring washer for connection to main ground grid.

Tests

Upon completion system and equipment shall be subjected to standard tests for checking the acceptability of the system with reference to relevant IS and IE rules.

Six (6) copies of Routine tests Certificate shall be submitted for approval prior to the dispatch of the concerned equipment from works.

GROUNDING NOTES

1. Grounding work shall conform to the requirements of the following latest standard, statutory provision is amended upto date:

   IS : 3043 – 1987 –Code of practice for earthing.
   Indian Electricity act, 1910
   Indian Electricity Rules – 1956

   Contract Specifications
   Enclosed grounding drawings

2. The ground shall be connected with main grid available in the yard.

3. The earth pit shall be as per enclosed drawing and connected to the ground grid conductor.

4. Riser / pig tail from the ground grid conductor shall be as per typical details shown in the enclosed drawing .

5. All ground connection below the grade shall be made by Electric arc welding with low hydrogen content electrode Bonding of the conductor where necessary shall be done by gas heating.

6. The ground conductors shall be interconnected between them and top the main ground grids through risers.

7. All electrical equipments and associated non-current carrying metal works, supporting structures, building columns, fence, and system neutrals lightening mast / arrestors shall be connected to the ground grid system.

8. Two separate and distinct ground connections shall be provided for earthing of electrical equipment frame work in compliance with I.E. rules.

9. Misc. devices such as push button stations, lockout switches and cable end boxes etc. shall be grounded effectively whether specifically shown or not.

10. For ground connections, the conductor sizes shall be as listed below:

Equipment	G.I. Steel flats / wires
a. 33 / 11 KV equipments	1 No. 50 x 6mm
b. Structures, cable trays etc	1 No. 50 x 6mm
c. LT/HT panels	1 No. 50 x 6 mm

11. Ground conductor connection above the grade shall be generally made by electric arc welding.

12. Bolted connections shall be made only for grouting equipment devices and removable structures. The contact surface shall be thoroughly cleaned before connection to ensure good electrical contact.

13. A continuous 50x6mm GI flats ground c conductor shall be installed on one bank of vertical/horizontal trays and securely attached to such tray section, forming a solidly grounded trays system.

    Before installing 50x6mm GI flats ground conductor along the cable tray run the cable trays welding joints in cable to ground tray supports shall be painted as specified.

14. Where two or more trays run together in one bank either vertically/ horizontally provide a continuous conductor on the top tray only on taps to each section of to other tray at 10M interval.

15. Fence within the ground grid shall be bounded the palmily at regular interval not exceeding ten (10) Meters. Fence generally separately grounded with flexible connection before type

16. Earth pit shall be provided at connection

17. All welding joints in ground conductor above the ground shall be coated with two coats of cold galvanizing anti-cursive paint after welding.

18. For typical detail of grounding refer drawing enclosed.

9. SPECIFICATION FOR H.T. TRANSFORMER

1.00.00 DESIGN CRITERIA

The transformer will be used to supply power to 11 KV switchgear.

The transformer shall be capable of continuous operation at specified rating under the following condition:

a. Voltage variation …….. ± 10%
b. Frequency …….. ± 5%
c. Combined voltage and Frequency variation (Absolute sum) ……. 10%

The transformer shall be capable of withstanding the short circuit stresses due to a terminal fault on one winding with full voltage maintained on the other winding for minimum period of three (3) sec.

1.00.01 The transformer shall be free from annoying vibration. The design shall be such as not to cause any undesirable interference with radio or communication circuits.

2.00.00 **SPECIFIC REQUIREMENTS**

2.01.00 **Tanks**

2.01.01 Tanks shall be of all welded construction and fabricated from good commercial grade low carbon steel of adequate thickness. All seams shall be double welded.

2.01.02 The tank shall be reinforced by stiffener to ensure rigidity so that it can withstand without any deformation (a) mechanical shock during transportation and (b) oil filling by vacuum.

2.01.03 All removable covers shall be provided with weather proof, hot oil resistant, resilient gaskets. The design shall be such as to prevent any leakage of water into or oil from the tank.

2.01.04 Each transformer tank shall be provided with one set of bi-directional rollers for looping for rolling the transformer parallel to either centre line.

2.01.05 Jacking pads, lifting eyes and pulling lugs shall be provided to facilitate movement of the transformer. All heavy removal parts shall be provided with eye bolt for ease of handling.

2.01.06 Manholes / hand holes of sufficient size shall be provided for access to leads, windings, bottom terminals of bushing and taps.

2.02.00 **Core & Coils**

2.02.01 The transformer may be of core or shell type. The core shall be built up with high grade, non-aging, low loss, high permeability grain oriented cold-rolled silicon steel laminations specially suitable for core material. The material shall be prime core only documentary evidence should be got approved by the purchaser before delivery of transformer.

2.02.02 The coil shall be manufactured from electrolytic copper conductor and fully insulated for rated voltage.

2.02.03 Insulating material shall be of proven design. Coils shall be insulated to that of impulse and power frequency voltage stresses of minimum.

2.02.04 Coil assembly shall be suitably supported between adjacent sections by insulating spacers and barriers. Bracing and other insulation used to for assembly of the winding shall be arranged to ensure a free circulation of the oil and to reduce the hot spot of the winding.

2.02.05 All leads from the winding to the terminal board and bushing shall be rigidly supported to prevent injury from vibration short circuit stresses. Guide tube shall be used where practicable.

2.02.06 The core and coil assembly shall be securely fixed in position that no shifting or deformation occurs during movement of transformer or under short circuit stresses.

2.03.00 **Tapings**

2.03.01 ON-Circuit taps as specified shall be provided on the high voltage winding.

2.03.02 The transformer shall be capable of operation at its rated KVA on any tap provided the voltage does not vary by more than ± 10% of the rated voltage corresponding to the tap.

2.03.03 The winding including the tapping arrangement shall be designed to maintain electromagnetic balance between HV and LV winding at all voltage ratios.

2.04.00 **ON-Circuit Tap Changer**

2.04.01 The ON-circuit tap changing will be effected by a 3-phase gang operated switch. Arrangement shall be such that switch can be operated at standing height from ground level.

2.04.02 The operating handle can be padlocked at any tap position. The design shall be such that the lock cannot be inserted unless the contacts are correctly engaged.

2.04.03 The mechanism shall be silver plated and held in position under strong contact pressure to ensure low contact drop and avoid pitting.

2.05.00 **Insulating oil**

2.05.01 The transformer shall be filled with mineral insulating oil suitable inhibited to prevent sludging. First filling of oil along with 10% excess shall be furnished for the transformer. Oil shall be supplied in non-returnable containers suitable for outdoor storage.

2.05.02 Oil preservation shall be by mean of conservator tank complete with silica gel breather & oil seal

2.06.00 **Bushing**

2.06.01 Bushing shall be solid porcelain oil communicating type.

2.06.02 Bushing shall be provided with terminal connectors of approved type and size.

2.06.03 Bushing location shall provide adequate phase and ground clearance.

2.07.00 **Terminal Arrangements**

2.07.01 Terminals for cable connection shall be brought out through top cover to a detachable cable end box with disconnect link.

2.07.02 Cable end box shall be self supporting, weather proof, air filled type with sufficient space inside for termination and connection of cables.

2.07.03 Cable end box shall be furnished complete with removable gland plate, double compression brass glands and necessary hardware.

2.07.04 In general, the arrangement shall be such as to permit removal of the transformer without dismantling the cable installation.

2.07.05 Termination for 33 KV side connection shall be brought through top cover mounted outdoor type bushings.

2.08.00 **Marshalling box**

2.08.01 A sheet steel, weather proof, IPW55 marshalling box shall be provided for the transformer. The box shall contain all auxiliary devices except those which must be located directly on the transformer.

2.08.02 All terminal blocks for owner's cable connection shall be located in this box. Terminal blocks shall be ELMEX 10mm² or approved equal.

2.08.03 The marshalling box shall be provided with cubicle lamp with door switch, space heater with thermostat and removable cable gland plate.

2.09.00 **Wiring**

2.09.01 All control, alarm and indication devices provided with the transformer shall be wired upto the terminal blocks.

2.09.02 Wiring shall be done with PVC wires in conduit or PVC armoured cable minimum wire size shall be 2.5mm² copper not more than two wires shall be connected to a terminal 10% spare terminals shall be provided.

2.09.03 All device and terminal blocks within the marshalling box shall be identified by symbols corresponding to those used in applicable schematic or wiring diagram.

2.10.00 **Grounding**

2.10.01 Two grounding pads, located on the opposite sides of the tank, shall be provided for connection to station ground mat.

2.10.02 Grounding pad shall have clean buffed surface with two tapped holes, M10 GI bolts and spring washers for connection to 50 x 5mm GI flat.

2.10.03 Ground terminals shall be also provided on marshalling box to ensure its effective earthing.

2.11.00 **Auxiliary Equipment**

2.11.01 Neutral bushing current transformer shall be furnished where specified in the annexure.

2.11.02 The current transformer shall be cast resin type.

2.11.03 The arrangement shall be such that the C.T can be removed form the transformer without removing the tank cover.

2.11.04 C.T secondary leads shall be wired upto the terminal blocks. The terminals for C.T secondary leads shall have provision for shorting. The secondary leads of C.T shall have polarity marking as per IS.

2.12.00 **Painting**

2.12.01 All steel surfaces shall be thoroughly cleaned by sand blasting or chemical agents, as required, to produce a smooth surface free of scales, grease and rust.

2.12.02 The internal surfaces in contact with insulating oil shall be painted with heat resistant insulating varnish which shall not react with and be soluble in the insulating liquid used.

2.12.03 The external surfaces, after cleaning, shall be given a coat of high quality red oxide or yellow chromate primer followed by filler coats.

2.12.04 The transformer shall be finished with two coats of battle ship gray (IS shade # 632) synthetic enamel paint.

2.12.05 The paints shall be carefully selected to withstand tropical heat, rain etc. The paint shall not scale off or crinkle or be removed by abrasion due to normally handling.

2.12.06 Sufficient quantity of touch up paint shall be furnished for application after installation at site.

2.12.07 If it is considered necessary, the transformer may be given a further coating at site by the owner. The bidder shall therefore indicate the type and quality of the of the paint with full specification for this purpose.

4.00.00 **TESTS**

4.01.00 Routing Tests
During manufacture and on completion, all transformer shall be subjected to the IS routine tests. In addition, the following tests shall be performed on each transformer:

4.01.01 Transformer tank with coolers shall be tested for leaks with normal head of oil + 35 KN/m² for a period of 12 hours. If any leak occurs, the test shall be conducted again after all leaks have been repaired.

4.01.02 The tank designed for full vacuum shall be tested at an internal pressure of 3.33 KN/m² (25 mm of Hg) for an hour. The permanent deflection of flat plates shall not exceed CBIP specified figures on release of vacuum.

4.01.03 After assembly, each core shall be pressure tested for one minute 2 KV AC between all bolts, side plates, structural steel works and the core.

4.01.04 Excitation loss and current measurements shall be made at 90%, 100% and 110% of the rated the voltage.

4.02.00 **Type Tests**
Type test certificate of the following on any transformer, shall be furnished,. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.
a. Impulse withstand test
b. Temperature rise test

4.03.00 **Miscellaneous**

All component parts and auxiliary equipment such as oil, bushings, CTs etc. shall be routine tested as per relevant Indian standard.

4.04.00 **Test witness**

Test shall be performed in presence of owner's representative if so desired by the owner. The contractor shall give at least thirty (30) days advance notice of the date when the tests are to be carried out.

4.05.00 **Test certificates**

4.05.01 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the owner.

4.05.02 The equipment shall be dispatched from works only after receipt of owner's written approval of the test reports.

4.05.03 Type test certificate on any equipment, if so desired by the owner, shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

5.00.00 **SPECIAL TOOLS & TACKLES**

5.01.00 A set of special tools & tackles which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.

5.02.00 The tools shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

6.00.00 **SPARES**

The bidder shall submit a list of recommended spare parts for three (3) years satisfactory and trouble free operation, indicating the itemized price of each item of the spares.

7.00.00 **DRAWING DATA & MANUAL**

7.01.00 Drawing, data and manuals shall be submitted in triplicate with the bid and in quantities and procedure as specified in general condition of contract and / or elsewhere in this specification for approval and subsequent distribution after the issue of letter of intent.

7.02.00 **To be Submitted with the bid**

7.02.01 Typical general arrangement drawings showing disposition of cooler banks, fittings, terminal arrangement etc.

7.02.02 Transport / shipping dimension and weights, space required for handling parts for maintenance.

7.02.03 Technical leaflets on major component and fittings.

7.02.04 Type test certificate on similar transformer.

7.03.00 **To be submitted for approval and distribution.**

7.03.01 Dimensioned general arrangement drawing showing disposition of cooler banks and various fittings.

7.03.02 Transport / shipping dimensions with weights, wheel base detail, untanking height etc.

7.03.03 Foundation plan & loading.

7.03.04 Overhead line / cable termination arrangement.

7.03.05 Control schematics an wiring diagrams.

7.03.06 Any other relevant drawing or data necessary for satisfactory installation, operation and maintenance.

7.03.07 Instruction manuals on transformer and its various fittings.

7.03.08 The format of testing & commissioning of all the substation equipments and DG sets have to be provided atleast 2 weeks prior to the commissioning.

7.04.00 The bidder may note that the drawings, data and manuals listed are minimum requirement only. The bidder shall ensure that all other necessary write ups, curves and information required to fully describe the equipment offered are submitted with his bid.

System fault level : 25 KA system at 33 KV

Over fluxing : Core shall be suitable for over fluxing up to 10% due to combined effect of voltage & frequency.

The transformer shall be designed such that ONAN rating as indicated shall be achieved. The bidder will however indicate the price of transformer of 10 MVA rating with all radiators and cooling system required for ONAN transformer.

FITTINGS AND ACCESSORIES

Transformer shall be equipped with fittings and accessories as listed below:-

1. Oil conservator with filler cap, drain plug and plain oil level gauge.
2. Silica gel breather with connecting pipe and oil vent.
3. Air release plugs.
4. Pressure release device. Explosion vent, should be of double diaphragm type.
5. 150mm dial magnetic oil level gauge with low level alarm contacts.
6. 150mm dial oil temperature indicator with maximum reading pointer and electrically separate contacts for trip and alarm.
7. 150mm dial winding temperature indicator with maximum reading pointer and electrically separate sets of contacts for trip and alarm.
8. Thermometer pockets.
9. Double float Bucholz relay with gas release cock, shut-off valve on either side and separate sets of contacts for trip and alarm.
10. Filter valve with threaded adopter (top and bottom).
11. Drain valve with threaded adopter.
12. Sampling valve.
13. Jacking pads, handling and lifting lugs.
14. Cover lifting eyes.
15. Bi-directional rollers and skid complete with clamping device with nuts and bolts for clamping the transformer on inverted channel.
16. Hand hole of sufficient size for access to interior of the tank.
17. Two grounding pads each complete with two (2) nos tapped holes, M-10 GI bolts and washer for transformer tank cover and radiator tank.
18. Weather proof marshalling box for housing control equipment and terminal connections.
19. Rating and terminal marking plates.
20. H.T bushing and L.T side cable end box.
21. ONAN cooling system complete with isolator valves and all necessary accessories.
22. Provision for ONAF cooling complete with fans, control cabinet and all necessary accessories.
23. L.V neutral bushing separately brought out for earthing of transformer neutral.
24. Copper flexible with lug duly installed for affecting earthing of equipment component like radiators, top cover of tank etc.
25. Externally electrical operated lockable ON circuit tap changer.
26. 10% extra transformer oil as per clause 2.05.01

Note:

All indication, alarm, trip contacts provided shall be rated for 0.5A at 110V DC.

10. SPECIFICATION FOR CONTROL RELAY PANEL

1.00.00 DESIGN CRITERIA

1.01.00 The control panels will be used for control, monitoring & protection of the electrical system.

1.02.00 The control panels shall be free standing, floor mounted, duplex panel having inside corridor & shall be dust & vermin proof conforming to degree of protection IP-52. the panel matching to existing control panel installed in 33kV SS

1.03.00 Design, material selection & workmanship shall be such as to present a neat appearance outside & inside with no welds, rivets, screws or bolt heads apparent from the exterior surfaces of control panel.

1.04.00 Equipment layout & design features of the control panel, are also shown in the enclosed drawings. The control panel shall be constructed generally in line with these drawings. The size of panel indicated in the drawing are tentative.

1.05.00 The panels shall be liberally sized so as to provide spacious layout of equipment & devices with sufficient working space in between. In case the dimensions given in the enclosed drawings are found inadequate for the purpose, the bidder may increase panel size or alternatively number of panels.

2.00.00 SPECIFIC REQUIREMENTS :-

2.01.00 Construction

2.01.01 Control board shall consist side by side & bolted together with existing panel to form a compact unit.

2.01.02 The control panel shall be folded steel construction, assembled on channel / angle base plates with anti-vibration mountings.

2.01.03 The panel shall be fabricated of not less than 2 mm thick sheet steel, free from all surface defects. The panel shall have sufficient structural reinforcement to ensure a plane surface, to limit vibration & to provide rigidity during shipment & installation.

2.01.04 Access door shall be provided with channel rubber/ neoprene gaskets all round & latches sufficiently strong to hold them in alignment when closed. The operating handle shall have locking arrangement.

2.01.05 The panel shall be complete with floor channel sills, vibration damping pads & stainless steel kick plates.

2.02.00 Equipment Mounting

2.00.01 All instruments, relays, switches etc. shown mounted on the panel shall be of flush or semi-flush type.

2.00.02 All equipment shall be so mounted that removal & replacement may be accomplished individually without interruption of services to others.

2.00.03 All equipment inside the panel shall be so located that their terminals & adjustments are readily accessible for inspection or maintenance.

2.03.00 Nameplates

2.03.01 Nameplates of approved design shall be furnished for each panel & for each instrument or device mounted on panel.

2.03.02 The material shall be lamicoid or approved equal, 3mm thick, with white letter on black background.

2.03.03 The name plate shall be held with self-tapping screws. The size of nameplate shall be approx 20mm x 75 mm for equipment & 40mm x 150mm for panels.

2.03.04 The nameplates for panel shall be provided both on the front at on the rear.

2.03.05 Control & meter selection switches shall have integral nameplates. Nameplates for all other devices will be located below the testing device.

2.03.06 Instrument & device mounted on the face of the control panel shall also identified on the rear with the instrument or device case.

2.04.00 Mimic Diagram

2.04.01 Mimic Diagram of electrical connections shall be furnished on the front face of electrical control panels in accordance with the existing panel board.

2.04.02 Mimic buses shall be at least 10mm in width, made of suitably treated metal strips or approved equivalent & colour coded to denote different voltages.

2.04.03 The mimic representation, colour & size of diagram are subject to the approval of the owner.

2.05.00 Illumination, Space Heating & Receptacles

2.05.01 Panel shall be provided with interior illumination lamp with door switch, space heater with thermostat & 5A, 3 pin receptacle with plug.

2.05.02 Lamp, heater & receptacle circuits shall be suitable for available A.C. supply & furnished with individual ON-OFF switch.

2.05.03 The lamp shall be located at the ceiling & guarded with protective cage. Space heater shall be located near the floor so as not to pose any hazard to service personal.

2.06.00 AC/DC power Supply

2.06.01 The following power supplies will be made available to control board :-

A.C Supply : Single Feeder
D.C Supply : Duplicate Feeder

2.06.02 The supplier shall provide isolating switch fuse units for the incoming AC/DC power supplies & run bus wires for power distribution to different panels.

2.06.03 MCB & link shall be provided for individual circuits for protection & also for isolation from bus wire without disturbing other circuits.

2.06.04 The Contractor shall group the MCB requirement in each level in a neat, orderly & easily accessible fuse blocks or distribution panel.

2.06.05 Alarm relays shall be provided to annunerate failure of incoming AC & DC power supplies to the control panel.

2.07.00 Wiring

2.07.01 The control panel shall be fully wired up at the factory to ensure proper functioning of control, protection & metering schemes.

2.07.02 All spare contacts of relays & switches shall be wired upto terminal blocks. All interconnections between the panels of the control panel shall be furnished.

2.07.03 Wiring shall be done with flexible, heat resistant, 1100V grade, PVC insulated, switch board wires with standard copper conductor, 2.5 Sq.mm square for control & current circuits & 1.5 Sq.mm for voltage circuits.

2.07.04 Each wire shall be identified at both ends with wire designation as per contractor's wiring diagram. Interlocking type ferrules shall be used for identification.

2.07.05 All wire termination shall be made with insulated sleeves crimping type lugs. Wire shall not be tapped or spliced between terminals.

2.07.06 Wiring shall be neatly bunched in groups by non-metallic cleats or bands. Each group shall be adequately supported along its run to prevent sagging or strain on the termination.

2.08.00 Terminal Block

2.08.01 Terminal Block shall be box-clamp type ELMEX 10 mm square with marking strips or approved equal. Terminals for C.T. secondary leads shall have provision of shorting & grounding.

In future, IIT may install a computer aided monitoring & control system for its distribution network. For this purpose minimum 2NO: 2NC contacts duly wired upto the terminal blocks from each breaker is to be provided.

2.08.02 Not more than two wires shall be connected to one terminal. If necessary, a number of terminals shall be jumpered together to provide wiring points.

2.08.03 Each terminal shall be identified with designation as per approved schematic. Spare terminals equal in number of 20% active terminals shall be furnished.

2.08.04 The wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

2.08.05 The terminal blocks shall be located to allow easy access & also to suit floor opening for cable entry.

2.08.06 Unless otherwise specified, terminal blocks shall be mounted vertically with adequate spacing (not less than 100mm) between adjacent rows.

2.08.07 The bottom of the terminal block shall be at least 200mm above the incoming cable gland plate.

2.09.00 **Cable Entry**

2.09.01 The panel shall have provision of cable entry from the bottom. Bottom plate shall be provided to make entry dust tight.

2.09.02 The panel shall have provision inside for fixing the multi-core cable glands. The cable gland support plate shall be 4mm thick & mounted not less than 200mm above floor level.

2.10.00 **Grounding**

2.10.01 50 x 6mm copper ground bus shall be provided on each control panel extending along the entire length of the assembly.

2.10.02 The ground bus shall have two-bolt drilling with GI bolts & nuts at each end to receive Owner's ground connection of 50 x 6mm G.I. flat.

2.10.03 The ground bus shall be bolted to the panel structures & effectively ground the entire assembly. The cases of meters, relays & switching devices shall be grounded bus & connected to it.

2.10.04 Whenever a circuit is shown grounded, a single wire from the circuit shall be run independently to the ground bus & connected to it.

2.11.00 **Painting**

2.11.01 All steel surfaces shall be sand blasted to remove all rust, scale & foreign adhering matters. The steel surfaces shall be taken chemically cleaned, rinsed, phosphated, rinsed & coating.

2.11.02 Immediately after phosphating, the surfaces shall be given two coats of high quality primer & stoved after each coating.

2.11.03 The control panels shall be finished with two coats of synthetic enamel paints, white inside & the light gray or dove gray outside. The panels shall be stoved after spraying of each of the finish coating. Base frame shall be painted black.

2.11.04 The panels shall have a smooth & uniform matt finish, free from scratches, dents & any other imperfection. Sufficient quantity of touch-up paints shall be furnished for application at site.

2.11.05 The Bidders are requested to furnish the details process adopted by them for pre-treatment & painting of sheet metal for the control panels.

2.12.00 **Switches**

2.12.01 Switches shall be dust protected, heavy duty, and switchboard type complete with escutcheon plate. Contacts shall be silver surfaced & rated minimum 10A at operating voltage.

2.12.02 Breaker control switch shall be multistage. Spring return to normal, with lost motion device & pistol grip handle, EE type DDS or approved equal.

2.12.03 Meter selection switch shall be maintained contacts, stay-put type, with knob handle, KAYCEE type SRP or approved equal. Ammeter switch shall have make before break contacts.

2.13.00 **Push Button**

2.13.01 Push Button shall be oil tight, heavy duty, push to actuate type with coloured button & inscription plate marked with its function.

2.13.02 Each push button shall have minimum 1 NO + 1 NC contacts, rated 10A at operating voltage.

2.13.03 Push button shall be shrouded type except for emergency trip button which shall be mushroom type for easy identification.

2.14.00 Lamps

2.14.01 The lamps shall be low-watt LED type & coloured lenses. Lamps & lenses shall be replaceable from the front of the panel.

2.14.02 15% extra lamps & lenses shall be provided as part of initial supply.

2.15.00 Operating Range

Unless otherwise specified, all instruments & relays shall be suitable for operation on 5A C.T. secondary circuits &/ or 110V V.T. secondary circuit as shown in drawings.

2.16.00 Meters (Digital Display)

11.01.03 All indicating instruments shall be switchboard type of size 96 x 96mm & accuracy class of ±2% of the full scale.

11.01.03 Each breaker shall be with volt meter, amp meter with selector switches & KWH meters.

11.01.03 Watt-hour meter shall be provided in drawout cases with built- in test facilities. Alternatively, they may have test block to facilities testing of meter without disturbing C.T. or V.T. secondary connections.

2.17.00 Integrators

2.17.01 Integrators meter shall be rectangular in shape & furnished in drawout type case with built-in test facilities.

2.17.02 Watt hour meter shall be 2 element type suitable for 3 phase, 3 wire connection & shall have cyclometer register with six digits.

2.18.00 Relays

2.18.01 Relays shall be furnished in rectangular, dust tight, draw out type cases with built-in test facilities. Small auxiliary relays may be furnished in fixed casing & mounted inside the panels.

2.18.02 Protective relays shall be equipped with externally reset positive action operation indicator.

2.18.03 All relays, unless otherwise approved, shall have minimum two electrically separate pairs of contacts. Contacts shall be silver surfaced, bounce-free & capable of repeated operation without deterioration.

2.18.04 The system single line diagram is enclosed. The Bidder shall carefully study the same to offer relays of suitable type & setting range to meet the system requirements.

2.19.00 Auxiliary Devices

The contractor shall furnish, install & wire up all auxiliary devices such as interposing current or voltage transformer, timing/ switching/ lockout/ auxiliary relays as specified or as required for proper functioning of the schemes offered.

2.20.00 Annunciator System

2.20.01 The annunciator system shall be solid state type with optical isolation for input signals. The functional requirements shall be as per Annexure.

2.20.02 The annunciator group shall be complete with its own power supply, audible alarms, acknowledge reset-test buttons & other necessary accessories.

2.20.03 The annunciator shall be non-integral type with hardware box mounted separately for easy access & maintenance.

2.20.04 Audible alarms with different tones shall be used for fault & ring back functions.

2.20.05 The window size shall be such as to accommodate minimum three (3) lines of twelve (12) character shall be minimum 4.75mm high.

2.20.06 The annunciator system shall be suitable for operation from both NO & NC type initiating contacts.

3.00.00 Tests

3.00.01 Each control board shall be completely assembled, wired, adjusted & tested at the factory prior to shipment.

3.02.00 Routine Tests

3.00.01 The tests shall include wiring continuity tests, insulation tests & functional tests to ensure operation of the control/ protection/ metering schemes & individual equipment.

3.00.02 All switches, meters, relays & other devices shall be tested & calibrated in accordance with relevant IS standards.

3.03.00 Test Witness

The tests shall be performed in presence of engineer in-charge, if so desired by the Institute. The contractor shall given at least thirty (30) days advance notice of the date when tests are to be carried out.

3.04.00 Test Certificate

3.04.01 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Purchaser.

3.04.02 The equipment shall be dispatched from works only after receipt of Purchaser' s written approval of the test reports,

3.04.03 Type test certificate on any equipment, if so desired by the Purchaser, shall be furnished, Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

4.00.00 SPECIAL TOOLS & TACKLES

4.01.0 A set of special tools and tackles which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.

4.02.0 The tools shall be shipped in separate container, clearly marked with the name of the equipment for which they are intended.

5.00.00 SPARES

The bidder shall submit list of recommended spare parts for three (3) years satisfactory & trouble free operation indicating the itemized price of each item of the spares.

6.00.00 DRAWINGS, DATA & MANUALS

6.01.00 Drawings, Data & Manuals shall be submitted in triplicate with the bid & in quantities & procedures as specified in general condition of contact and/or elsewhere in this specification for approval & subsequent distribution after the issue of letter of intent.

6.02.00 **To be submitted with the Bid.**

6.02.01 Typical general arrangement drawing of the control panels.

6.02.02 Bill of materials.

6.02.03 Technical leaflet & Catalogues on :

a.) Control panel
b.) Switches & lamps
c.) Meters & Relays
d.) Annunciator System
e.) Auxiliary Devices.

6.03.0 To be submitted for Approval & Distribution.

6.03.01 Dimensional general arrangement of the control board showing equipment disposition & identification.

6.03.02 Foundation plan & loading diagram, clearly showing panel fixing arrangement, floor opening for cable entry etc.

6.03.03 Schedule of materials & label inscriptions.

6.03.04 Detailed control Schematics, based on Owner's based drawing clearly showing terminal & wire numbering.

6.03.05 Three-line diagrams for meter & relay connections.

6.03.06 Back of board wiring diagram showing all equipment & devices in their relative physical positions & all wiring upto the terminal blocks.

Equipment/ Device & terminals shall be identified with designations/ numbers as per approved schematic & connection diagrams.

6.03.07 During review of these drawings, Engineer will indicate connection of outgoing cables with cable numbers & lead markings. These shall be incorporated in the Contractor's drawing for final distribution.

6.03.08 Data sheets and instruction manual for each piece of equipment.

6.04.00 The Bidder may note that the drawings, data & manuals listed are minimum requirements only. The Bidder shall ensure that all other necessary write-ups, curves & information required to fully describe the equipment offered are submitted with his bid.

7.00.00 A.C. / D.C. POWER SUPPLY

7.01.01 System Voltages

All systems shall be designed for satisfactory operation from the following power supply:-

A.C. Supply	:	433//240V, 3 phase, 50 Hz, 4 wire effectively grounded system. Fault level 50 kA rms Symmetrical.
D.C. Supply	:	110V,2 wire, ungrounded. Fault level 10 kA .

7.01.02 Permissible Variation

Equipment & accessories shall be suitable for operation over the entire of voltage / frequency variation as listed below :-

A.C. Supply	:	Voltage	.....	± 10%
	:	Frequency	.....	± 5%
	:	Combined Volt + Freq.	.....	10% (absolute sum)
D.C. Supply	:	Voltage	.....	95-125 Volt.

7.01.03 Supply point

A.C. / D.C. supply will be made available only at one point of control board.

8.00.00 ANNUNCLATOR

8.01.01 **TYPE**

The annuncition system shall be manually, reset type suitable for operation from 110V DC ungrounded supply.

8.01.02 **FUNCTION**

The sequence of operation shall be as under :

Field Condition	Visual Display	Audible Alarm
Normal	Off	Silent
	Abnormal Fast blinking	On
Acknowledge	Steady On	Silent
Return to normal	Slow blinking	Silent
Reset	Off	Silent
Normal Before Acknowledge	Slow blinking	On
Acknowledge	Steady On	Silent
Reset	Off	Silent
Test	Fast blinking	On

9.00.00 RELAYS & METERS

The Bidder shall be furnish, install & co-ordinate the settings of all relays to suit the requirements of protection, operation & as broadly indicated below :

9.01.00 **Transformer Differential Relay**

9.01.01 High speed percentage Differential relay with harmonic restraint shall be provided for Transformer differential protection.

9.01.02 The relays shall have a high set instantaneous trip attachment for clearly heavy internal fault.

9.01.03 The relay shall be capable of compensating mismatch due to C.T. saturation during heavy through fault & to ensure stable operation.

9.01.04 The harmonic restraint feature shall ensure its stability on magnetizing inrush without sacrificing its speed of operation for internal fault.

9.02.00 **Restricted Ground Fault Relay (64)**

9.02.01 Restricted Ground Fault protection shall be used to guard against ground fault in earthed neutral transformer.
9.02.02 The relay shall be instantaneous high stability circulating current type.

9.02.03 The relay shall be unaffected by uneven C.T. saturation during through-fault or by presence of D.C. component in the fault current.

9.03.00 Over current & earth fault Relay (50/51 & 50N/51N)

9.03.01 A set of phase & ground over current relays shall be furnished as specified.

9.03.02 The relays having inverse definite minimum time current characteristics with adjustable settings shall be as follows :-

Ground fault current	10 to 40%
Phase over current	50 to 200%

9.03.03 The relay having instantaneous characteristics with adjustable setting is as follows :

i) Over current
   For Transformer feeder - 400-1600%
   For power feeder - 200-800%
ii) Earth fault - 100-400%

9.04.00 Lockout Relays (86)

9.04.01 Lockout Relays shall be fast-operating, hand reset type with multi-contacts for a number of switching operations.

9.04.02 The relays shall be designed for a high degree of mechanical stability & shall have heavy duty contacts.

9.05.00 Lockout Supervision Relay (74)

9.05.01 Each lockout relay circuit shall have supervision relay which will initiate alarm in case of any trouble in lockout circuit/ relay.

9.05.02 This relay shall be properly co-ordinate with the characteristic of lockout relay to prevent any mal-operation.

9.05.03

9.06.00 Auxiliary Relays

Voltage operation aux. relays shall be used for pre-trip & trip alarm / annuncition & tripping for rise in oil & wdg temperature, closing of bucholzer's relay contact & for low oil level in transformer.

10.00.00 The Scope of work includes the following relays but is not limited to this only, the details specifications/ drawing must be referred for completeness

10.01.00 Protection for transformer

10.01.01	VAA23	auxiliary relay-OIL, TEMP ALARM/TRIP
10.01.02	VAA23	auxiliary relay-winding, TEMP ALARM/TRIP
10.01.03	CDG21	Non-dir IDMT O/c relay with high set-A Ph
10.01.04	CDG21	Non-dir IDMT O/c relay with high set-C Ph
10.01.05	CDG21	Non-dir IDMT E/F relay with high set
10.01.06	VAA23	auxiliary relay-BUCH. TEMP ALARM/TRIP
10.01.07	CAG14	Rest. Earth fault relay
10.01.08	VAA23	auxiliary relay-BUCH./WDG TEMP TRIP
10.01.09	VAX31	Trip circuit supervision relay
10.01.10	VAA11	Auxiliary relay-DC supply supervision
10.01.11	VAJHM23	Tripping relay
10.01.12	DTH31	Transformer differential relay

10.02 **Protection for 33 kV switchgear**

10.02.01 CDG21 Over current Non directional IDMT with high set A Ph.
10.02.02 CDG21 Over current Non directional IDMT with high set C Ph.
10.02.03 CDG 21 Earth fault Non directional IDMT with high set
10.02.04 VAX31 Trip circuit supervision relay
10.02.05 VAA11 Auxiliary relay-DC supply supervision
10.02.06 VAJH13 Tripping relay

10.03.00 Protection (For H.T. Supply 12 KV panel)

The protection to be provided for different type of circuits are listed below:-

10.03.01 CDG21 Over current Non directional IDMT with high set A Ph.-11KV INC-1
10.03.01 Over current Non directional IDMT with high set A Ph.- 11KV FDR-1
10.03.01 CDG 21 Over current Non directional IDMT with high set A Ph.-11KV INC-1
10.03.01 CDG 21 Over current Non directional IDMT with high set A Ph.-11KV INC-1
10.03.01 CDG 21 Over current Non directional IDMT with high set A Ph.-11KV INC-1
10.03.01 VAX31 Trip circuit supervision relay INC-1
10.03.01 VAX31 Trip circuit supervision relay FDR-1
10.03.01 VAA11 Auxiliary relay-DC supply supervision
10.03.01 VAJH13 Tripping relay-INC-1
10.03.01 VAJH13 Tripping relay-FDR-1

All inverse time O/C relay shall be of 3 sec. Version. All definite time O/C relay shall have adjustable time range of 0-6 sec.

A part from protection relay's each & every breaker shall be provided with auxi. Contact multiplier relay, anti-pumping relay, trip supervision relay, lockout relay, test terminal block. These relay shall be hand reset.

11. SPECIFICATION FOR POWER AND CONTROL CABLES

1.00.00 **DESIGN CRITERIA**

1.01.00 The cable will be used for connection of power and control circuits of the owner's electrical system.

1.02.00 Cable will be either laid on ladder type trays or directly buried in ground.

1.03.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and/or this specification.

1.04.00 The insulation and sheath materials shall be resistant to oil, acid and alkali and shall be enough to withstand mechanical stresses during handling.

1.05.00 Armoring shall be single round wire of galvanized steel for multicore cables and aluminium for single core cable.

1.06.00 Core identification for multicore cable shall be provided by colour coding.

2.00.00 **SPECIFIC REQUIREMENTS**

2.01.00 **L.V. Power cables**

1100 Volt grade, heavy duty armoured power cables with stranded aluminium conductors, XLPE insulation and extruded PVC overall sheath.

2.02.00 **Control Cables**

1100 Volt grade, 70°C rating, control cables with standard copper conductor, PVC insulation, round wire armour and extruded PVC overall sheath.

2.03.00 Drum Length & Tolerance

Each size of the control cable shall be supplied in one length.

2.04.00 **Cable Identification**

Cable identification shall be provided by embossing on the outer sheath the following :

a. Manufacture's name or trade mark
b. Voltage grade
c. Year of manufacture
d. Type of insulation e.g. PVC etc.

3.00.00 **Joints and Termination**

Material of construction for joints / termination shall perfectly match with the dielectric chemical and physical characteristics of the associated cables. The material and design concept shall incorporate a high degree of operating compatibility between the cable and the joints. The protective outer covering (jacket) used on the joints / terminations shall have the same qualities as that of the cable oversheath in terms of ambient / operating temperature and fire retardant properties withstand capability and resistance of hazardous environment and corrosive elements.

4.00.00 **TESTS**

4.01.00 **Shop tests**

The cables shall be subject to shop tests in accordance relevant standards to prove the design and general qualities of the cables as below:-

4.01.01 Routine tests on each drum of cables

4.01.02 Acceptance tests on each drum s chosen at random for acceptance of the lot.

4.01.03 Type tests on each type of cable, inclusive of measurement of armour D.C resistance of power cables.

4.02.00 **Test witness**

Tests shall be performed in presence of engineer-in-charge if so desired by the Institute. The contractor shall give at least thirty (30) days advance notice of the date when the tests are to be carried out.

4.03.00 **Test Certificates**

4.03.01 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the owner

4.03.02 Test reports shall be completed with all details and shall also contain IS specified limit values, wherever applicable to facilities review.

4.03.03 The cable shall be dispatched from works only after receipt of owner's written approval of the test reports.

5.00.00 **SPECIAL TOOLS & TACKLES**

5.01.00 A set of special tools and tackles which are necessary or convenient for splicing, jointing and termination of different types of cables.

5.02.00 These special tools and tackles shall includes but not limited to:-

a. Splice-cum-insulation remover for control cable 1 No
b. Hand operated compression tools with a set of dies for different cable sizes 1 No
c. Hydraulically operated compression tools with a set of dies for different cable sizes. 1 No

5.03.00 The tools shall be shipped in separate containers, clearly marked with the service for which they are intended.

6.00.00 **SPARES**

The bidder shall submit a list of recommended spare parts for three (3) years satisfactory and trouble free operation, indicating the itemized price of each item of the spare.

7.00.00 **DRAWING, DATA & MANUALS**

7.01.00 Drawing data manuals shall be submitted and in quantities and procedures as specified in general conditions of contract and / or else where in this specification on approval & subsequent distribution after the issue of letter of intent.

7.02.00 To be submitted with the bid:

a. Manufacture's catalogues giving cable construction details and characteristics.
b. Cable current rating for different type of installation inclusive of operating factors for ambient temperature, grouping etc.
c. Write-up on manufacture's recommended method of splicing, jointing, termination etc. of the cables.
d. Type test report on H.V power cable.

7.03.00 To be furnished for Approval and distribution:

a. Confirmed cable data.
b. Shop test reports.

12. SPECIFICATION FOR ELECTRICAL ERECTION

1.00.00 GENERAL

1.01.00 The tenderer shall furnish & install all materials & equipment which are obviously a part of the completed installation but have not been specifically mentioned in this specification without any additional charge to the Authority.

1.02.00 All ladders, platforms, scaffolding, temporary supports, any other facility required for erection at site shall also be provided.

1.03.00 The tenderer shall at all times work in close coordination with Engineer-in-charge supervisory personnel & afford them every facility to become familiar with the erection & maintenance of the equipment.

1.04.00 The tenderer shall arrange his schedule of work & method of operation to minimize inconvenience to other contractors at the project site. In case of any difference between contractors. The decision of the Owner shall be final & binding on all parties concerned.

1.05.00 In case of any hold up due to fault of other contractors or for any other reason, the tenderer shall bring it to the notice of the engineering-in-charge in writing without any delay. Otherwise any delay in completion of his work will be accounted for.

1.06.00 In case of any contradiction/ confusion with any other section/ sub-section of this specification, the same shall be referred to the Engineer-in-charge in this respect shall be final & binding.

2.00.00 REGULATIONS

The complete installation shall meet the requirements of the latest edition of the relevant Indian Standard & I.E. Rules.

3.00.00 DRAWINGS

The tenderer shall inform himself fully with the relevant Electrical layout single line diagram & schematic drawings enclosed with the package specification.

The tenderer shall furnish all erection drawings, catalogue data sheets, etc as required to cover specific information for all items.

4.00.00 TRANSPORATION

The contractor shall be responsible for the transportation to the site of all equipment, materials & supplies to be provided by him according to terms of the contract. The contractor shall be responsible for arranging transportation as advised by Owner depending on requirement & to meet the completion schedule. In the event of the schedule requiring change in the mode of transportation the same shall be arranged by the contractor without any extra cost.

5.00.00 UNLOADING

The contractor shall arrange to unload equipment received at site & also arrange to transport the material from the unloading point to site.

The contractor shall make all necessary arrangement for tools & tackles, men & machinery for unloading of equipment at site & its transportation to site or storage. It is clearly understood that demurrage, whereas & other expenses incurred by the contractor due to delayed clearance of the material or for any other reason, shall be to the contractor's account.

6.00.00 STORAGE AT SITE

The contractor shall provide coverage of the equipment & material, security arrangement & all other facilities required for proper & safe storage till completion of the work.

7.00.00 PROTECTION OF WORK

7.01.00 The contractor shall effectively protect his work at his own expense, equipment & material under his custody from theft, damage or tampering.

7.02.00 Finished work where required shall be suitably covered to keep it clean & free from defacement or injury.

7.03.000 For protection of his work contractor shall provide fencing & lighting arrangement connect up space heaters & provide heating arrangement as necessary or directed by Engineer-in-charge.

7.04.00 Contractor shall be responsible for any loss or damage to equipment & material until his work is fully & finally accepted.

8.00.00 OPENING OF CASE, CHECKING AND CLEANING OF PART

8.01.00 All packing cases or package shall be opened in presence of Owner's reprehensive.

8.02.00 All equipment, accessories & materials i.e. Switchgear, transformer, bus duct, power &control cables etc after receipt at site shall be jointly inspected & checked with packing list & identified with erection drawings.

8.03.00 All claims against loss or damage in transmit shall be lodged by the contractor under intimation to Owner. The contractor shall be responsible for processing and settlement of claim including furnishing any information that may be required in this connection.

8.04.00 The contractor shall ensure that insurance formalities are observed & any loss of claim due to the fault of the contractor shall be to the contractor's account.

8.05.00 All parts shall be thoroughly cleaned all rust removed & surface polished as required.

8.06.00 Cleaned & polished parts shall be coated with anti-corrosive paints where necessary & stored with care, ready for erection.

9.00.00 TESTING EQUIPMENT

The major testing equipment that are required to be arranged by the contractor are listed below :

a.) Insulation Tests :

i) Power operated Meggar - 1 kV & 2.5 kV grade

ii) Hand operated Meggar - 500 Volt/ 1100 Volt grade

b.) Hand driven earth Resistance Meggar, range 0-1/3/30 Ohms.
c.) High potential testing set- roller mounted type
d.) Tong testers of suitable ranges

e.) Contact resistance measuring set for micro-ohms
f.) Torque wrench of various sizes.
g.) Multimeters, test lamp, field telephone with buzzer set, different gauges etc.

10.00.00 PAINTING

After completion of the erection, all equipment & materials supplied under this specification shall be given necessary protective painting. The colour of the final coat shall be approved by the Owner.

11.00.00 ERECTION

11.01.00 Method & materials

11.01.01 All work shall be installed in a first class, neat & workman like manner by mechanics skilled in the trade involve. All details on the installation shall be mechanically & electrically correct.

11.01.02 All materials shall be brand new & of best available quality without having imperfections & blemishes. Where two or more units of the same manufacture.

11.01.03 All conduits & equipment shall be installed in such a manner as to preserve access to any other equipment installed.

12.00.00 DETAILED REQUIREMENT OF INSTALLATION:

12.01.01 All alignment, leveling, grouting, base channel fixing & anchoring adjustments shall be carried out in accordance with manufacturer's instructions and install necessary floor steel for supporting the panels.

12.01.02 All connections, in switchgear shall be completed, checked and adjusted to ensure safety & satisfactory operation of the equipment.

12.01.03 In some cases minor modifications may have to be carried out at site in the wiring & mounting of the equipment to meet the requirement of desired control scheme & the contractor shall have to do the same at no extra cost.

12.02.00 Transformer

12.02.01 The contractor shall place the transformer on its foundation, assemble parts, fabricate & erect & supporting structure for detachable type cable chamber.

12.02.02 H.V. test of transformer oil shall be carried out taking a sample from individual transformer. If the result is not in satisfaction of the purchaser, oil conditioning of that particular transformer shall have to be carried out.

12.03.00 L.T. Bus duct shall be erected duly supported on the soffit on the building by structural member supplied along with the bus duct. The bus duct will pass through separate wall between transformer & switchgear & will reset on two flanges one each at the switchgear & The transformer end. The grounding of the bus duct shall be carried as per the relevant stranded. The flanges supplied alongwith the bus duct shall be erected & terminals end equipment namely transformer & switchgear will be connected to the bus duct. The bus duct shall be erected in straight, vertical or horizontal formation as per the site requirement. The test like mili volt drop on the contacts, insulation resistance value & proper tightness shall be ensured by the contractor.

12.03.01 For draining out of oil a oil soak pit for transformer is to be erected of the suitable capacity.

12.04.00 Miscellaneous items :

12.04.01 The tenderer shall install miscellaneous minor items to complete the installation of equipment.

12.04.02 These equipment will be generally floor or wall mounted. The exact location will be as decided by the Owner at site or as shown in Final drawings.

12.04.03 All support & bracket needed for installation shall be fabricated & painted by the tenderer.

12.04.04 All welding, cutting, chipping & grouting as & when necessary shall be carried out by the contractor.

12.05.00 Handling of cable drum and cable

12.05.01 Rolling of drum shall be avoided as far practicable. For short distance, the drums may be rolled they are rolled slowly and in proper direction as marked on the drum. In absence of any identification, the drums may be rolled in the same direction as it was rolled during taking up the cable.

12.05.02 For unreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending. The drum shall be rolled on the spindle slowly, so that cable should come out over the drum & not below the drum.

12.05.03 While laying cable, cable shall be used at an interval of 2 meters. The cable shall be pushed over the roller by a gang of people positioned in between rollers. The cable shall not be pulled from the end without laying intermediate pushing arrangement. Bending radius shall not be less than what is specified by manufacturer.

12.06.00 Cable laying :

Cables shall generally be installed in cable trays except for some short runs in buried formation or in conduit / pipe for protection or crossing. Multi core power cables laid on trays & riser shall be neatly dressed & clamped with fabricated 25 x 3 mm G.S. flat or cable tray at an interval of maximum 1 meter for vertical / inclined run & 1.50 meter for horizontal run. Control cables may be laid in single layer with touching formation. Power & control cables shall be claimed in separate group. Power & control cables shall not be laid in a common tray excepting in very special case where a gap of 150 mm shall be maintained between power & control cables.

12.06.01 H.T. & L.T. power cables shall be laid in cable tray in single layer & with spacing equal to the diameter of cable.

12.06.02 Control cables can be laid upto a maximum of three layers in each tray.

12.06.03 Both power & control cables shall be clamped to the tray rungs by means of clamp made up of 25 x 3 mm fabricated G.S. flat at an interval of 1500 mm for horizontal run & 1000 mm for vertical / inclined cable run.

12.06.04 The cable trays shall be run with a vertical spacing of 300 mm cable trenches. A minimum of 300 mm clearance shall be provided between the top of tray & beams, cold piping, 500 mm clearance for hot piping/ object to facilitate installation of cables in tray.

12.06.05 Adequate pull boxes shall be provided in conduit run to facilitate. Cable pulling in long runs & also to ensure that there will be no more than 270 degree bend between the pull points.

12.06.06 Cable tray shall be installed to accommodate cable manufacturer's recommended maximum pulling tension & minimum bending radius.

12.06.07 All openings in the floor & wall for cable access shall be sealed after installation of the cable system with

non-inflammable materials.

12.06.08 All floor / wall openings for cable entry to the electrical equipment & accessories shall be sealed with non-inflammable material, after completion of cable installation. Thickness of such materials shall be equal to the thickness of floor / wall.

12.07.00 Cables-power & control :

12.07.01 The tenderer shall install & connect all power & control cable required for complete installation within his scope of work. Type & size of power & control cable shall be as specified & as supplied under a separate sub section for power & control cable.

12.07.02 In general all power & control cable shall be run in cable trays in cable trenches. Isolated runs of control cables shall be run in rigid conduit.

12.07.03 Jointing of power cable should be avoided as far as possible. However, if any splicing of control cable is required to carry out interlock it will be done in junction boxes not in the conduit or in the trays. Such junction boxes shall be in the scope of tenderer.

12.07.04 The contractor shall not install cables with different voltage grade in the same cable tray.

12.07.05 During cable installation care shall be taken so that the actual bending radius of each cable is not less than the one recommended by the cable manufacturer.

12.07.06 For cables buried directly underground there shall be a stone free sand cushion both above & below the cable run being held by brick wall supports on two (2) sides. The excavated portion above the top sand cushion shall be covered by concrete precast slab supported on the side walls & finally filled up with standard back fill.

12.07.07 Cables shall be pulled into the trenches in strict accordance with the cable manufacture's instruction.

12.07.08 Tenderer shall furnish & install suitable solderless crimping type cable lugs at the termination of all wires & cables if not already furnished with the equipment.

12.07.09 All exposed conduits & armoured cables shall be tagged with the numbers that appear in the conduit & cable schedules as prepared by the tenderer. All conduits & armoured cables shall be tagged at their entrance and/ or exist from any piece of apparatus, junction box or pull box. Aluminium tags shall be used with the number engraved/ punched on the tag. Tag shall be suitable secured to the conduit or armoured cable.

The cable tags shall also be provided at all bends and at interval of 30 M on straight run of cable in order to facilitate the identification.

12.07.00 Laying termination & connection of all control cables for interlock, protection, indication & annunciation.

The tenderer shall prepare cable schedule & interconnection diagram & submit the same for approval of the Authority. Cable laying shall be started with the approval cable schedule & interconnection diagrams. Separate cables for each type of following services/ functions as applicable shall be used & laid along the run for each feeder.

a.) Power - designate as 'P'
b.) Control protection interlock, metering, indication & annunciation designate as 'C'.

13.00.00 FIELD TESTING:

13.01.00 Field Testing shall be required for all the equipment & accessories furnished, installed or connected by the tenderer to ensure proper installation, setting, connection & in accordance with the plans, specifications & manufacturer's recommendations.

Testing shall be conducted in presence of Owner's engineers with prior notice at least 2 weeks before commencement of any test.

13.02.00 Field testing work shall be done as per the latest edition of the relevant standards. All tests recommended by the equipment manufacturer shall be conducted. The tenderer shall submit the list of all field tests to be conducted for all equipment & accessories for review / approval by the Owner.

13.03.00 Testing shall include any additional tests suggested by the Owner that he deems necessary because of field conditions to determine that equipment, materials & system meet requirements of the specification.

13.04.00 The tenderer shall depute qualified personal to conduit all testing & shall provide all labour & testing equipment required for & incidental to testing.

13.05.00 The tenderer shall be responsible for any damage to equipment & material due to improper test procedure or test apparatus & shall replace or restore to original condition of any damaged equipment or material.

13.06.00 The tenderer shall maintain in quadruplicate a written record of all tests showing date, personal making the tests, equipment or material tested, test performed & result. Two copies of test records shall be given to the Authority.

14.00.00 COMMISSIONING :

After the satisfactory test are performed the equipment & material shall be put on trial operation by the tenderer. After successful trial operation, the equipment shall be put on performance tests. Initially at no load condition & finally with different loading conditions.

13. Specifications for LT Panel/ Switchgear

- **CONSTRUCTION:-**

- Switchgear enclosure shall conform to the degree of protection IP4x minimum thickness of sheet metal used shall be 2 mm.
- The switchgear shall comprise a continuous line up of single / Multi-tire cubicles. The installations of circuit breakers however shall be limited to the bottom two tires only.
- The design shall be of fully compartmentalized execution with metal/ insulating portions. Working height shall be limited between 750 mm to 1800 mm from the floor level.
- Each breaker shall be housed in a separate cubicle, complete with an individual front access door; each vertical section shall have a removable back cover. All doors & covers shall be gasketed.
- Switchgear cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.
- All switchgear, lamps & indicating instruments shall be flush mounted on the respective cubicle door whereas relays & other auxiliary devices of any may be mounted on a separate cubical.

- **BUS AND BUS TAPS**

- The main buses & connections shall be of high conductivity aluminium alloy, as per IS : 5082 sized for specification current rating with maximum temperature limited to 85 degree C (i.e., 35 degree C rise over 50 degree C ambient). Bus bars shall be designed for a maximum current density of 0.8A/ sq.mm.
- All bus connections shall have adequate contact pressure which should be ensure by means of two bolt connections with plain & spring washers locknuts. Bimetallic connections between dissimilar metals.
- Bus connections shall be fully insulated for working voltage with adequate phase / ground clearances.
  - Insulating sleeves for bus bars & surrounds for joints shall be provided.
  - Bus insulator shall be flame-retardant, track resistant type with high creep age surface.
- All buses & connections shall be supported & braced to with stand the stresses due to maximum short circuit current & also to take care of any thermal expansion.
- Bus-bars shall be sleeved in colour coded manner for easy identification & so located that the sequence RYB shall be from left to right, top to bottom of front to rear, when viewed from the front of switchgear assembly.
- Bolted disconnected links shall be provided from all incoming & outgoing feeders for isolation of neutral, if necessary.

- **<u>CIRCUIT BREAKER</u>**

- Circuit breaker shall be three poles, single throw, air breaker type with stored energy, trip free mechanism & shunt trip. The circuit breaker of the outgoing feeder shall have an in built microprocessor base release, short circuit, over current & earth fault protection release.
- Circuit breakers shall be draw out type, having SERVICE, TEST & ISOLATED position with positive indication for each position along with in built relay unit.
- Circuit breaker of identical rating shall be physically & electrically interchangeable.
- Circuit breaker shall be motor wound spring charged mechanism, motor voltage should be 240 V AC.

For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open close-open operation of the circuit breaker shall be possible after failure of power supply to the motor. Power supply for this motor shall be taken from the output of auto changeover.

- Mechanical safety interlocking shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.
- Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.
- Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter & mechanism charge/ discharge indicator.
- In additional to the auxiliary contacts required for normal breaker operation & indication, each breaker shall be provided with following for interlocking purpose:-

a) Position/ cell switch with 4 NO. + 4 NC contacts. These shall be available as spare for automation work.

Control Supply:- 230V AC for closing, Tripping &

indication lamps.

a. Auxiliary switch, with 6 NO+ NC contact,

mounted on the stationary portion of the switchgear &

operated mechanically by a sliding level from the

breaker, in SERVICE position. These shall be available

as spare for automation work.

- Limit / auxiliary switches shall be convertible type, that is, suitable for changing NO contact to NC & Vice-Versa.

- **Moulded Case Circuit Breakers**

- Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip
- free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of microprocessor based electronic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Electronic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities:

- Shunt trip
- Alarm switch

- Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- De interlocking device to open the door even if the breaker is in ON position. MCCBs shall

have rupturing capacity as specified in drawings/schedule of quantities.

i) MCCB shall be triple pole air break.

ii) The MCCB shall have a quick - make, quick - break mechanism operated by a suitable external rotary handle, complete with position indicator this handle shall have provision for pad locking in ON & OFF position.

iii) MCCB should have microprocessor base electronic release with over current, earth fault & short circuit

protection equivalent to L&T 'D' since with RC-10 release.

- **CONTROL & INDICATION :-**

The circuit breaker shall be wired up wired up for both local & remote operation. A local- remote selector switch shall be provided for this purpose. Each breaking cubicle shall be equipped with following:-

- One (1) Test- neutral - service selector switch stay put type with test/ service position pistol grip handle & key interlock for breaker marked 'E'.
- Two (2) heavy duty, oil tight push buttons for TRIP & CLOSE.
- Three (7) LED indicating lights on front of compartment:- GREEN : Breaker open & spring charged

RED : Breaker close

AMBER : Trip / circuit healthy condition WHITE :

Control supply failure

Phase indication : One Red, One Blue & One Yellow

O & 1 NC should be provided for status monitoring of the remote / local position.

- Lamps shall be low watt, LED type lamp & lens shall be replaceable from the front.
- The general scheme of connections for control, interlock & protection shall got approved before fabrication of panel.
- **FUSES :-**
- Fuses shall be HRC, preferably link type with a minimum interrupting capacity equal to the short circuit current.
- Fuses shall be furnished complete with fuse base & fittings of such as to permit easy & safe replacement of fuse element. Visible indicated indication shall be provided on blowing of the fuse.
- **CURRENT TRANSFORMER :-**

Current transformer shall be cast- resin type. All secondary connections shall be brought out to terminal blocks where or delta connection will be made.

- Ratings :

- for incomers and bus coupler 1500-

750/5+5 : 3 sets

- For out goings :

  800-400/5+5 : 4 sets

  600-300/5+5 : 4 sets

  400-200/ 5+5 : 2 sets

- Accuracy class of the current transformers shall be :-

  a. Class 5P10 for other relaying (protection).

  b. Class 1.0, ISF < 5 for metering.

- **RELAYS :-**

- Relays shall be of draw out design with built in testing facilities. Small auxiliary relays may be in non-draw out execution.
- Relay shall be rated for operation on 5 Amp secondary current & 110 / 220 V secondary voltage; number & rating of relay contacts shall suit the job requirements.
- The contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection & interlock & as broadly indicated in the annexure & drawings.

- **METERS (digital display):-**

- Indicating instruments shall be switch board type & accuracy class of 2% .
- All Digital Watt-hour meter shall be provided, alternatively, they may have test block to facilitate testing of meter without disturbing C.T. or V.T. secondary connections.
- Each breaker shall be with volt meter, amp meter with selector switches & KWH meters. Only outgoing feeders will be relaxed from voltmeters.

- **SECONDARY WIRING :-**

i. The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, & interlocking schemes.

ii. Fuses & links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches & other devices shall be wired upto terminal blocks.

iii. Wiring shall be done with FRLS PVC flexible, 650V grade, PVC insulated switchboard wires with solid copper conductors of 2.5 sq.mm for voltage circuits along with numbered ferrules.

iv. Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractors wiring diagrams.

v. Wire terminations shall be made with crimping type connectors with insulating sleeves. Wire shall not be spliced between terminals.

11 **TERMINAL BLOCKS**

i) Terminal blocks shall be 660V grade box clamp type with marking strips, similar to ELMEX 10 sq.mm of equal. Terminals for C.T. secondary leads shall have provision for shorting.

ii) Not more than two wires shall be connected to any terminals equal in number to 20% active terminals shall be furnished.

iii) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

12 **CABLE TERMINATION :-**

i) Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for each of termination & connection.

ii) All provision & accessories shall be furnished for termination & connection of cables, including removable gland plates, cable supports, crimp type tinned copper/ aluminum lugs, brass compression gland with tapered washer (power cable only) & terminal block.

iii) Gland plate shall be minimum 4 mm thick.

13 **BUS DUCT CONNECTION :-**

i) Bus duct connections, where specified shall be furnished along with transportation of panel. Bus duct connections shall be generally from the top.

ii) All connecting bus work shall have the same continuous rating as associated switchgear bus & shall be fully braced for the listed short circuit current.

iii) All provision such as matching flange & other accessories shall be furnished for connection to bus duct if any, being supplied by this purpose will be furnished by contractor.

14 **GROUND BUS :-**

i) A ground bus, rated to carry maximum fault current, shall external full length of the switchgear.

ii) The ground bus shall be provided with two bolt drilling with GI bolts & nuts at each to receive 50 x 6mm GI flat.

iii) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker & draw out VT unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

iv) Whenever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus & connected thereto.

v) C.T. & V.T. secondary neutrals shall be earthed through removable links so removed without disturbing others.

15 **NAME PLATES :-**

i) Nameplates of approved design shall be furnished at each cubicle & at each instrument & device mounted on or inside the cubicle.

ii) The material shall be lamicoid or approved equal, 3mm thick with white letter on block background.

iii) The name plate shall be held self-tapping screws. Nameplate size shall be minimum 20 x 75 mm for instrument device & 40 x 150mm for panels.

iv) Caution notice suitable metal plate shall be affixed at the back of each vertical panel.

16. **SPACE HEATERS PLUG SOCKETS :-**

i) Each vertical section shall be provided with thermostat controlled space heater & 5A, 3 pin plug socket.

ii) Cubical heater, plug-socket circuit shall have individual switch fuse units.

17. A.C. / D.C. POWER SUPPLY :-

i) The following power supplied will be made available to the switchgear :

240 A.C. Supply : Two Feeders From these two single-phase feeders a reliable 240V, 1 Ph. AC bus shall be obtained using auto changeover scheme. The necessary equipment's for this scheme should be indicated.

The DC supply required for control purposes is to be obtained in each module through a rectifier arrangement, which will convert the 250V AC supply to 110V DC. The equipment necessary for this rectification including protective relaying as per the approved drawing are also to be included.

ii) Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 2-pole, single throw for A.C. & 2-pole, double throw for D.C. Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch- fuse units shall be provided at each cubicle for AC/DC supplies.

iii) AC load shall be so distributed as to present a balance loading on three-phase supply system.

18. PAINTING :-

i) All surfaces shall be sand blasted, pickled & grounded as required to produce a smooth, clean surface free of scale, grease & rust.

ii) After cleaning, the surface shall be given a phosphate coating followed by 2 coats of high quality prime & stove after each coat.

iii) The switchgear shall be finished in light gray (IS shade # 631) with two coats of synthetic enamel paint.

iv) Sufficient quantity of touch- up paint shall be furnished for application at site.

19. SPECIAL TOOLS & TACKLES :-

i) A set of special tools & tackle (manual charging handle & operating handle trolley for lifting outside breaker for maintenance) which are necessary or convenient for erection, commissioning, maintenance & overhauling of the equipment shall be supplied.

ii) The tools shall be shipped in separate containers (Tool Box) clearly marked with the name of the equipment for which they are intended.

20 PARES:-

i) The bidder shall submit list of recommended spare parts for three (3) years satisfactory & trouble free operation indicating the itemized price of each item of the spares.

21. **DRAWINGS, DATA & MANUALS :-**

i) To be furnished for approval after award of work.

a. General arrangement drawing showing constructional features, space required in front for withdrawals, power & control cable entry points etc.

b. Details of materials with specifications.

c. Typical foundation plan & loading.

d. Typical breaker control schematic.

e. Matching flanges & terminals for the bus termination.

f. Type test reports on circuit breaker.

g. Technical leaflet on

h. Circuit breaker

i. Instrument transformer

j. Relays, meters, switches etc.

k. Single line diagram

l. Control schematic

m. Wiring diagram

22 Instruction manuals of switchgear & individual equipment:-

The manual shall clearly indicate the installation method, checkup & tests to carried out before commissioning of the equipment.

23 The bidder may note that the drawings, data & manuals listed here in are minimum requirements only the bidder shall ensure that the other necessary write-ups, curves & information required to fully describe the equipment are submitted with his bid.

CIRCUIT BREAKER

Make - As per approved make. Type -

Microprocessor release air

- circuit breaker

Rated voltage - 415 Volts Rated

frequency - 50 Hz

Rated current - **1600/(Icu=Icf=1sec 50 kA)**

800A(Icu=Icf=1sec 50 kA)

No. of pole - 3

Aux. Voltage for trip/close coil - 110 V DC Motor for spring

charging Voltage- 240 V AC Protection unit - Equivalent to

SR-18G with fault indication & thermal masonry.

Interlocking arrangement electrically & mechanically with bus coupler & incomer.

PROTECTION (FOR LT SUPPLY 415V PANEL)

The minimum protections to provided for different type of circuit are listed below:-

INCOMING FEEDER:-

2 over current +E/F relay microprocessor based along with the element of instantaneous o/c & E/F protection.

BUS COUPLER:-

3 O/C relay microprocessor based

All inverse time O/C relay shall be 3 sec. Version.

All definite time O/C relay shall have adjustable time range of 0-6 Sec.

Apart from protection relays each breaker shall be provided with auxi. Contact multiplier relay,

anti-pumping relay, trip supervision relay, lockout relay test terminal block. These relay shall be hand reset.

- **Specifications for LT Bus Duct**

- **Design Criteria**
- The LT non phase segregated bus duct serve as a interconnection between the LT switchgear and outdoor LT transformer.
- The LT bus ducts will be installed partially indoor and partially outdoor in a hot, humid and tropical atmosphere. All panels associated.
- Bus duct associated equipment and wiring shall be provided with tropical finish to prevent fungus growth. All ventilation openings shall be screened and drains shall be filtered to prevent entrance of dust and insects.
- For continuous operation at specified ratings, temperature rise of the bus duct and auxiliary equipment shall be limited to the site permissible values stipulated in relevant standards and / or this specification.
- Bus duct and auxiliary equipment shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit currents listed in the annexure without any damage or deterioration of material.
- The bus ducts shall be self-cooled and shall not be equipped with blower or any other type of forced ventilation.
- Bus duct enclosure shall be of sheet steel.

1. **Specific Requirements.**

- **General**
- The LT bus duct shall be non-phase segregated enclosure type.
- The layout of the bus ducts shall be generally in accordance with enclosed drawings. The details shown however are only typical. Bidder may propose changes to suit his particular design.
- All parts and accessories shall have appropriate match mark and part numbers for easy identification and installation at site.

1. **Enclosure**

- Phase shall be enclosed in weather proof, dust-tight, enclosure of sheet steel fabricated type conforming to degree of protection of IP 55.
- Circumferential neoprene rubber gaskets shall be provided for dust tight joints with adjacent enclosure section.
- The bus enclosure shall have extended bellows or equivalent means to allow for temperature changes and vibrations. Flexible joints shall be provided in enclosures at all points where the bus duct terminates at equipment to withstand vibration, expansion/ construction and at suitable intervals in any straight run of the bus duct where expansion and contraction would otherwise result in stress in the supporting structures.
- All outdoor bus enclosures shall be so designed & constructed as to prevent accumulation of rain water on top sheet. Similarly all gasketted flanged joints shall be suitably protected against direct splashing of rain water in case of outdoor runs.
- Suitable inspection openings shall be provided for access to support insulators, bus joints, transformer terminals, switchgear terminals etc. All inspection openings shall have reliable

sealing arrangement with neoprene gaskets.

- Seal-off bushings complete with wall frame and support plates shall be provided where the bus duct penetrates the building wall. The seal is to prevent free exchange of air between indoor and outdoor portions of the bus duct.
- Silica-gel breather shall be provided on both indoor and outdoor portions of the bus duct.
- Filtered drains for drainage of condensate shall be provided at the lowest points and at

such locations where accumulation of condensate can be expected.

- Shipping length of the bus duct shall be not more than three (3) meters in length.

4. Bus Conductor

- The bus conductor shall be of high conductivity, aluminium allow, supported on wet process porcelain insulators.
- The bus conductor shall be designed for bolted connections throughout the run.
- Flexible connections shall be provided between bus sections to allow for expansion and contraction of the conductor. Flexible connections shall also be provide at all equipment terminations.
- All contact surfaces shall be silver plated to ensure an efficient and trouble-free connection. All connection hardware shall be non-magnetic and shall have high corrosion resistance.

5. Disconnect Link

- Removable bolted discount link shall be provided in the bus where shown on the drawing for the purpose of isolation.
- Disconnect link shall consist of a removable section of conductor and shall be so constructed as to permit easy removal or reinsertion without alignment difficulties.
- The bus on both sides of the link shall be rigidly supported so that the disconnect link is equal in mechanical strength to any other section of the bus.
- A minimum clearance of 300mm (12”) shall be provided between the disconnected bus sections with the link removed.

6. Insulators

- Bus support insulators shall be interchangeable, high creep, high strength, wet process, fine glazed porcelain. Alternatively good quality cast resin insulators.
- Insulator shall be mounted in such a way so as to permit easy removal or replacement without disassembly of the bus. The insulator mounting plate shall be designed for cantilever loading to withstand the short circuit.
- The conductor shall be fastened on the insulator through fixed and slip joints so as to allow conductor expansion or contraction without straining the insulator.
- Space heater shall be provided preferably located near to each insulator to avoid moisture condensation within bus-duct. No and wattage rating of space heater shall be decided by the tenderer.

7. **Connections & Terminations**

- All matching flanges seal off bushings, gaskets, fittings, hardware and supports required for termination of the bus duct at the switchgears, transformers shall be furnished.
- In this connection the contractor is required to coordinate through the Engineer in Charge with the suppliers of the switchgear, transformers with regard to connection details, mechanical and thermal

stresses.

- Flexible connections both for conductor and enclosure shall be furnished.
- At all equipment termination to provide for misalignment upto 25mm (1") in all directions.

8. Between bus duct supported from building steel to prevent transmission of vibration.

- The equipment terminal connections shall be readily accessible and shall provide sufficient air gap for safe isolation of equipment during testing.
- If the material of bus conductor and that of the equipment terminal connectors are different then suitable bi-metallic connectors shall be furnished.

9. **Grounding**

- A separately run 50x6mm GI flat suitably clamped along the enclosure shall be used as the ground bus. All parts of the bus enclosure supporting structures and equipment frames shall be bonded to above ground bus.
- Ground pad shall be bolted type to accommodate 50x6mm galvanized steel flats. Complete with suitable tapped holes, bolts and washers.

10. **Supporting Structures**

- All supporting structures required for hanging and/or supporting the complete bus duct shall be furnished. These include all members, indoor/outdoor posts, bolts, shims, base plate, beams, hangers, brackets, bracings and hardware.
- All buses shall be adequately supported and braced to successfully withstand normal operation, vibration, thermal expansion, short circuit forces and all specified design loads.
- Supports shall be designed to provide tolerance of plus/minus 12mm (1/2") in the horizontal and vertical directions.
- All steel members shall be hot dip galvanized after fabrication. All hardware shall be of high strength steel with weather resistant finish.
- Concrete foundation, building steel, concrete, inserts/plates will be provided by the owner.
- The contractor shall co-ordinate with the owner for this purpose giving well in advance the details of his requirements so as to enable the owner to arrange for the same in time.

11. **Wiring**

- All wiring for space heaters shall be done with insulated stranded copper conductor of not less than 2.5 sqmm cross section. Each wire shall be identified at both ends with wire designation as per contractor's wiring diagram and shall be brought out to a terminal box outside the bus duct.
- Terminal blocks shall be box-clamp type Elemex 10 sq.mm with marking strips or approved equal.
- At least 20% spare terminals shall be furnished in the terminal block.

3. **Name Plate**

- **S**uitable name plate shall be furnished with each piece of equipment.
- Materials for name plate shall be plastic/lamicoid, 3mm thick, using white letters on black background.

1. **Finish**

- Except for supporting steel structures which shall be galvanized, all equipment shall be finished with an undercoat of high quality primer followed by two coats of synthetic enamel paints.

- The interior surface finish shall be as per manufacturer's standard. The shade of exterior surface finish will be battle ship gray shade 632 as per IS-5.
- Pre-treatment consisting of degreasing, derusting etc. shall be done on all fabricated parts before painting or galvanizing.
- Paints shall be carefully selected to withstand heat and weather conditions. The paint shall not scale-off or crinkle or get removed by abrasion due to normal handling.
- Sufficient quantities of all paints and preservatives required for touching up at sites shall be furnished.

4. **Handling of cable drum and cable:**

- Rolling of drum shall be avoided as far practicable. For short distance, the drums may be rolled they are rolled slowly and in proper direction as marked on the drum. In absence of any identification. The drums may be rolled in the same direction as it was rolled during taking up the cable.
- For unreeling the cable, the drum shall be mounted on jacks or on cable well. The spindle shall be strong enough to carry the weight without bending. The drum shall be rolled on the spindle slowly, so that cable should come out over the drum & not below the drum.
- While laying cable, cable shall be used at and interval of 2 meters. The cable shall be pushed over the roller by a gang of people positioned in between rollers. The cable shall not be pulled from the end without laying intermediate pushing arrangement. Bending radius shall no be less than what is specified by manufacturer.

15. **Cable laying:**

- Cables shall generally be installed in cable trays except for some short runs in buried formation or in conduit / pipe for protection or crossing. Multi core power cable laid on trays & riser shall be neatly dressed & clamped with fabricated 25 x 3 mm G.S flat or cable tray at an interval of maximum 1 meter for vertical / inclined run & 1.50 meter for horizontal run. Control cables may be laid in single layer with touching formation. Power & control cables shall be claimed in separate group. Power & control cables shall be no be laid in a common tray excepting in very special case where a gap of 150 mm shall be maintained between power & control cables.
- H.T & L.T power cables shall be laid in cable trays in single layer & with spacing equal to the diameter of cable.
- Control cable can be laid upto a maximum of three layers in each tray.
- Both power & control cables shall be clamped to the trays rungs by means of clamp made up to 25 x 3 mm fabricated G.S flat at an interval of 1500 mm for horizontal run & 1000 mm for vertical / inclined cable run.
- The cable trays shall be run with a vertical spacing of 300 mm cable trenches. A minimum of 300 mm clearance shall be provided between the top of tray & beams, cold piping, 500 mm clearance for hot piping / object to facilitate installation of cables in tray.
- Adequate pull boxes shall be provided in conduit run to facilitate. Cable pulling in long runs & also to ensure that there will be no more than 270 degree bend between the pull points.
- Cable tray shall be installed to accommodate cable manufacture's recommended maximum pulling tension & minimum bending radius.
- All opening in the floor & wall for cable access shall be sealed after installation of the cable system with non-inflammable materials.
- All floor/ wall for cable entry to the electrical equipment & accessories shall be sealed with non-inflammable material, after completion of cable installation. Thickness of such materials shall be equal

to the thickness of floor / wall.

16. **Cable power & control:**

- The tender shall install & connect all power & control cable required for complete installa- tion with in his scope of work. Type and size of power& control cable shall be as specified & as supplied under a separate sub section for power and control cable.
- In general all power and control cable shall be run in cable trays in cable trenches. Isolated runs of control cables shall be run in rigid conduit. Jointing of power cable should be avoided as per as possible. However, if any splicing of control cable is required to carry out interlock it will be done junction boxes not in the conduit or in the trays. Such junction boxes shall be in scope of tenderer.
- The contractor shall not installs cables with different voltage in the same cable tray.
- During cable installation care shall be taken so that actually binding radius of each cable is not less than the one recommended by the cable manufacturer.
- For cable buried directly underground their shall be a stone free sand cushion both above and below the cable run being held by brick wall support on two (2) sides. The excavated portion above the top sand cushion shall be covered by concrete precast slab supported on the side walls & finally filled up with standard back fill.
- Cables shall be pulled into the trenches in strict accordance with the cable manufacture's instruction.
- Tender shall furnish & install suitable solder less crimping type cable lugs at the termination of all wires & cables if not already furnished with the equipment.
- All exposed conduits & armoured cables shall be tagged with numbers that appear in the conduit & cable schedules as prepared by the tenderer. All conduits & armoured cable shall be tagged at their entrance and / or exist from any piece of apparatus, junction box or pull box. Aluminum tags shall be used with the number engraved / punched on the tag. Tag shall suitable secured to the conduit or armoured cable.
- The cable tags shall also be provided at all bends and at interval of 30 M on straight run of cable in order to facilitate the identification.
- Laying termination & connection of all control cables for interlock, protection, indication & annunciation.

  The tender shall prepare cable schedule & interconnection diagram & submit the same for approval of the Authority. Cable laying shall be started with the approval cable schedule & interconnection diagrams. Separate cables for each type of following services/ functions as applicable shall be used & laid along the run for each feeders.

a) Power - designate as 'P'

b) Control protection interlock, meeting, indication & annunciation designate as "C".

17. **Filed Testing:**

- Filed testing shall be required for all the equipment & accessories furnished, installed or connected by the tenderer to ensure proper installation, setting, connection & in accordance with the plans, specification and manufacturer's recommendations.
- Testing shall be conducted in presence of Owner's Engineer (i.e., Engineer in Charge) with prior notice at least 2 weeks before commencement of any test.
- Filed testing work shall be done as per the latest edition of the relevant standards. All tests recommended by the equipment manufacturer shall be conducted. The tenderer shall submit the list of all filed tests to be conducted for all equipment & accessories for review

/ approval by the owner.

- Testing shall include any additional tests suggested by the owner that the deems necessary because of filed condition to determine that equipment, materials & system meet requirements of the specification.
- The tender shall depute qualified personal to conduit all testing & shall provide all labour and testing equipment required for & incidental to testing.
- The tender shall be responsible for any damage to equipment & material due to improper test procedure or test apparatus & shall replace to original condition of any damaged equipment or material.
- The tender shall maintain in quadruplicate a written record of all tests showing date, personal making the tests, equipment or material tested performed & result. Two copies of test records shall be given to the authority.

18. **Commissioning:**

After the satisfactory test is performed the equipment & material shall be put on trial operation by the tenderer. After successful trial operation, the equipment shall be put on performance tests initially at no load condition & finally with different loading conditions

Figure 2: Modified provisions in CPWD works manual 2019 regarding testing charges to be borne by contractor.

- **Specifications Automatic Fire Detection & Alarm System**

1. **SCOPE**

This specification covers the supply, installation, testing and commissioning of the Fire Detection Systems and generally comprise

- Provision of Smoke and Heat Detectors.
- Provision of Manual Call Points.
- Provision of Response Indicator Units.
- Provision of Audio Alarm units.
- Local and Main Control Unit for the System.
- Public Address System.
- Wiring between Detectors and Control Units to make the complete System

2. **STANDARDS AND CODES**

- Specification for Smoke Detectors BS 5445 : 1984
- Specification for Heat Sensitive Detectors

for use in automatic fire alarm Systems IS 2175 : 1977

- Code of Practice for installation of automatic Fire

Alarm System using Heat sensitive type Fire Detectors IS

2189: 1976

- Code of Practice for Electrical Wiring installations (

System voltage not exceeding 660 volts) IS 732 :

1963

- Automatic Fire Alarm Systems in buildings BS 3116 Part I
- Control and indicating equipment BS 3116 Part IV
- British Code of practice for installation and servicing of Fire Alarm Systems CP 1019 : 1972
- Underwriters Laboratory Specification for Smoke

Detectors UL 268

All equipment and the installation shall be as per the relevant Indian Standards Specifications. Where these Standards do not exist, the relevant British Standards or any other internationally accepted Standard shall apply.

3. IONISATION TYPE SMOKE DETECTORS

3.1 GENERAL

The Ionisation type Smoke Detectors shall be capable of sensing fire in the smoldering or the incipient stage. Smoke Detectors shall be sensitive to products of combustion of all materials like wood, paper, rubber, natural and synthetic fibres, plastic and common liquid hydrocarbons in accordance with the sensitivity requirements of BS 5445 Part 7 : 1984.

3.2 CONSTRUCTIONAL FEATURES

DETECTOR HEAD

The Smoke Detector enclosure shall be of white plastic moulded with high impact self extinguishing polycarbonate and shall be fitted to the base by a twist and lock action. Correct alignment of the electrical contacts in the base with the terminal pins of the Detector shall be ensured. The twist and lock action shall ensure a good electrical contact with the wiping action. Apertures in the Detector housing shall allow the free ingress of smoke through a stainless steel gauze and into the smoke sensing ionisation chamber.

IONISATION CHAMBERS

The Detector head shall incorporate two ionization chambers and twin radioactive sources namely Americium 241 having a radio activity of less than 1.0 micro curies. The radioactive source shall be mounted on a stainless steel electrode and shall be electrically insulated from the gauze and the chamber cage. The second radioactive source shall be mounted on the underside of the stainless steel electrode. Air within the chambers shall be ionized by the radioactive sources with the second being the sealed reference chamber in electrical series with the first - smoke sensing chamber. The gauze and the chamber cage shall provide electrical screening to the smoke sensing chamber.

DETECTOR BASES

The Detector bases shall be suitable for mounting directly on a 75 mm recessed round box or as required at the site. The bases shall have terminals which shall be suitable for receiving
1.5 sq mm PVC copper conductor or 2.5 sq mm PVC aluminium conductor cables. Access to the terminals shall be available from the front of the base after removing the Detector. A plastic cover shall be provided with each base to be fixed to the rear to eliminate the ingress of dust, water and insect into the Detector

LED INDICATION LAMP

A LED lamp shall be incorporated which shall normally flicker at the rate of six flashes per minute indicating alertness and shall turn steady when a fire is sensed enabling immediate identification of the Detector.

ELECTRONICS

The Printed Circuit Board electro tinned copper tracks shall be protected from corrosion by a green epoxy solder resist coating. The tracks and solder joints shall be protected against fungus growth by an insulating

varnish coating.

The sensitive electronic components shall be protected by a high resistivity silicone encapsu- lation compound. All electronic components shall be electrostatically screened.

The electronic design and circuit shall provide the following safety devices:

- protection against high voltage spikes on the supply line.
- protection against polarity reversal.
- protection of the ionization chamber monitoring circuits from high voltage static Discharges.
- protection against high frequency transients.
- detection of alarm at the control unit even in the event of LED failure.
- protection against transient spikes on long lead lines to the remote indicators

DETECTOR WIRING

The Smoke Detector shall be suitable for 2 wire monitored supply.

OPERATIONAL PARAMETERS

The Detectors shall be suitable for operation at a maximum ambient temperature of 60 deg C. and a minimum of 0 deg C with a maximum relative humidity of 90%.

The Detector sensitivity shall remain constant and not vary with change in the ambient temperature, humidity, pressure or voltage by more than +/- 10%.

The performance of the Detectors shall not be effected by continuous air flows upto 10 meters per second.
The Detectors shall be suitably protected against the accumulation of dust and insects. The Smoke Detectors shall comply to the requirements of BS 5445 Part 7 : 1984 and EN 54 Part 7 : 1984 for Vibration, Impact and Shock parameters.

The Smoke Detectors shall be designed and constructed to meet the requirements of IP 43.

DETECTOR TESTING IN SITU

It shall be possible to functionally test the Detector as well as assess its actual sensitivity without having to remove the same.

DETECTOR CERTIFICATION

The Smoke Detector shall be UL Listed and tested and approved by independent Authorities for certified compliance and acceptance to the relevant Standards. The Detectors shall be approved by the Local Fire Authorities and relevant documentation shall be supplied with the tender.

4. HEAT SENSITIVE RATE OF RISE CUM FIXED TEMPERATURE TYPE DETECTORS

4.1 GENERAL

The Heat Sensitive Detectors shall be of the rate of rise cum fixed temperature detection type and shall comply to the requirements of IS 2175 : 1977 and NFPA Standard 721. The detectors shall respond to a rate of rise in temperature of 8 deg C per minute and a fixed temperature of 57 deg C.

4.2 CONSTRUCTIONAL FEATURES

The Heat Detectors shall be of the plug-in type and shall be attached to the mounting plate by a twist and lock motion. The Detector body shall be of moulded plastic, white in colour. The electrical contacts

and other moving parts of the Detector shall be enclosed in such a manner that will afford protection against moisture, dust, insects and other foreign matter. All make and break contacts shall be of silver or any other metal or alloy of equivalent characteristics.

The body and other parts shall be made of material inherently resistant to corrosion.

Any adjustments made at the factory shall be sealed and all adjustment screws shall be provided with a reliable means of locking to avoid disturbance of the adjustments in transit. In addition, the means of adjustment shall be rendered inaccessible to prevent tampering when the Detector is being installed or during its operation.

4.3 MOUNTING PLATES

All Detectors shall be installed on mounting plates moulded from white self extinguishing thermoplastic. The Detector shall be attached to the mounting plate with a twist and lock motion. The mounting plate shall be suitable for installation on a 75 mm round recessed box.

4.4 DETECTOR OPERATION

The Detector head shall house a thermostat or a fusible alloy as a fixed temperature element. When activated the external heat collector shall drop to provide a visual confirmation that the fixed temperature element has operated.

A pneumatic element shall sense the rate of rise in temperature by expansion of air within a sealed chamber faster than it can escape through the calibrated vent. The resultant increase in pressure shall depress a diaphragm causing the electrical contacts to close a circuit and trigger an alarm. The rate of rise element shall be of the self restoring type.

4.5 DETECTORS APPROVALS

The Detectors shall meet the performance requirements as per Clause 5 of IS 2175 : 1977 and/or other International Standards. The Detectors shall be UL Listed and FM approved and shall meet the approval requirements of the Local Fire Authorities. Test certificates from independent authorities and the approvals for the Detectors shall be furnished with the tender.

5.0 HEAT SENSITIVE FIXED TEMPERATURE TYPE DETECTORS

5.1 GENERAL

The Heat Sensitive Detectors shall be of the fixed temperature detection type and shall comply to the requirements of IS 2175 : 1977 and NFPA Standard 721. The detectors shall respond to a fixed temperature of 57 deg C. or 94 deg C as specified.

5.2 CONSTRUCTIONAL FEATURES

The Heat Detectors shall be of the plug-in type and shall be attached to the mounting plate by a twist and lock motion. The Detector body shall be of moulded plastic, white in colour. The electrical contacts and other moving parts of the Detector shall be enclosed in such a manner that will afford protection against moisture, dust, insects and other foreign matter. All make and break contacts shall be of silver or any other metal or alloy of equivalent characteristics.

The body and other parts shall be made of material inherently resistant to corrosion.

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The Detectors shall meet the performance requirements as per Clause 5 of IS 2175 : 1977 and/or other International Standards. The Detectors shall be UL Listed and FM approved and shall meet the approval requirements of the Local Fire Authorities. Test certificates from independent authorities and the approvals for the Detectors shall be furnished with the tender.

6. MANUAL CALL POINTS

Manual Call Points shall consist of a push button switch housed in a dust tight sheet steel enclosure of 1.5 mm thick sheet to manually initiate audio visual alarms. The front shall be sealed with a breakable glass cover fixed in such a way that the actuating push button is kept depressed as long as the glass is intact and released automatically when the glass is broken. The front face of the Manual Call Box shall have an area not less than 5000 sq mm and the element shall have an exposed area of not less than 1600 sq mm in the shape of a square or a rectangle.

A small steel hammer shall be attached to the assembly with a steel chain to facilitate breaking of the glass front. The Manual Call Box shall be suitable for surface or recessed mounting as required. The words "IN CASE OF FIRE BREAK GLASS" 5 mm high shall be painted in red on the front face.

7. RESPONSE INDICATOR

The Response Indicator shall consist of a red LED mounted in a sheet steel enclosure of 1.5 mm thick sheet suitable for surface or recessed mounting on walls or partitions as required. These shall be connected to the Detectors in the enclosed area to indicate the status of the Detector. In normal circumstances the lamp shall flicker but in the event of the Detector inside the enclosed area sensing a fire, the lamp shall glow steadily.

8. ILLUMINATED SIGNS

The Illuminated Signs shall have the letters "FIRE EXIT" or "NO FIRE EXIT" painted in red on a white perspex sheet as the front face of a sheet steel enclosure constructed with 1.5 mm thick sheet. The perspex sheet shall be back lit with an integral battery back up facility so as to operate independent of the mains supply in the event of a mains failure. The preferred dimensions of the Illuminated Signs shall be 450 mm length and 225 mm height with 100 mm high lettering. They shall be suitable for surface or recessed mounting as required.

9. ALARM SIRENS

Electronic audio alarm sirens shall be suitable for operation on the DC supply of the System and will be actuated from the Main Control Panel in the event of a fire. These shall have a two tone modulated alarm signal for continuous service with an output of 100 dB at a distance of 3 metres.

10. MAIN CONTROL PANEL

10.1 GENERAL

The Main Control Panel (MCP) shall be centrally located and shall form the nerve centre of the total System. The MCP shall continuously monitor the status of each Fire Zone.

10.2 CONSTRUCTIONAL FEATURES

The MCP shall be metal enclosed, sheet steel cubicle pattern, dead front, floor/wall mounting type as required and suitable for indoor mounting.

The MCP shall be dust and vermin proof. Synthetic rubber gaskets shall be provided on all covers and doors to render the joints dust and vermin proof. All doors shall be lockable.

The MCP shall be fabricated from 2.0 mm CRCA thick sheet steel and shall be folded and braced to provide a rigid support. Joints shall be seam welded.

10.3 MAIN CONTROL PANEL CONFIGURATION

The MCP shall monitor the status of each Fire Zone and shall be configured to include:

a) **Microprocessor** based electronic panel complete with a facia to provide the following indications and controls:

- "FIRE" indication one per zone.
- "FAULT" indication one per zone.
- "FIRE TEST" push button one per zone.
- "ZONE ISOLATE" switch one per zone.
- "DETECTOR FAILURE - OPEN CIRCUIT - SHORT CIRCUIT" indication.
- "DETECTOR REMOVED" indication.
- "BREAK IN WIRING" indication with initiation of alarm

b) Mother Board to control and monitor the entire System with audio/visual alarms and with a facia to provide the following controls and indications:

- "MAINS ON" switch with indicating lamp.
- "SYSTEM ON" switch with indicating lamp.
- "MAINS FAILURE" indication.
- "BATTERY LOW" indication.
- "LAMP TEST" push button.
- "STANDBY ON" indication.
- "SYSTEM RESET" push button
- "ALARM CANCEL" push button.
- "TRICKLE BOOST" toggle switch.
- "AUDIO ALARM" selector switches for general and/or zone wise broadcast..
- "AUTO/MANUAL" selector switch for the Illuminated Signs

c) Power Supply for the System integral with the MCP. The power supply rating shall be adequate for the Detectors, Illuminated Signs and all other devices as required in the System.

The power supply unit integral with the Control Panel shall consist of a 230/24 volt step down transformer. The 24 volt secondary of the transformer shall be rectified through a silicon diode bridge rectifier unit and the D C output filtered to minimize ripples. The unregulated 24 volt DC supply shall be regulated for the electronic circuits and the power to the entire System.

d) Screw type terminal blocks and cable glands for termination of all control wiring.

e) Required potential free spare contacts/ or as called for in Bill Of Quantities.

f) End of Line resistors as required by the System design shall be provided as a part of the Control Panel.

g) Audio visual alarm unit with a provision to sound an alarm throughout the building from the Main Control Panel either as a general broadcast or selectively as may be required.

10.4 ELECTRONICS

The Printed Circuit Board electro tinned copper tracks shall be protected from corrosion by a green epoxy solder resist coating. The tracks and solder joints shall be protected against fungus growth by an insulating varnish coating.

The sensitive electronic components shall be protected by a high resistivity silicone encapsu- lation compound. All electronic components shall be electrostatically screened.

The electronic design and circuit shall provide protection against high voltage spikes on the supply line

All Printed Circuit Boards shall be mounted in the MCP such that they can be pulled out from the front without the need for disconnecting any wires and shall therefore be mounted on rails and plugged directly into connectors.

10.5 DISPLAY

The Main Control Panel shall be complete with a display showing the layout of each floor of the Building/s and each Fire Zone marked clearly thereon for ready identification with the Zone indications and controls. The Display Panel shall be integral with the MCP and shall be etched in colour on a white perspex sheet as approved by the Engineer in Charge.

10.6 INTERNAL WIRING

All internal wiring shall be with 1.5 sq mm PVC insulated copper conductor wires colour coded and labelled with ferrules for easy identification. The wiring shall be properly bunched and harnessed. The wiring shall be done in a manner such that it is readily accessible from the front for maintenance.

10.7 SHEET STEEL TREATMENT AND PAINTING

Sheet steel materials used in the construction of the Panels should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of filler oxide primer before final painting.

All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

10.8 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels shall be provided for identification of the Fire Zones as approved by the Engineer in Charge.

11. REMOTE CONTROL PANELS

Remote Control Panels shall generally comply to the Specifications of the Main Control Panels as detailed in para 9 above. These shall be located remotely and will indicate the status of each Zone and the MCP but without any controls. The indications to be provided on the Remote Control Panel shall be :

- "FIRE" indication one per zone
- "FAULT" indication one per zone
- "DETECTOR FAILURE - OPEN CIRCUIT - SHORT CIRCUIT" indication one per Zone

- "DETECTOR REMOVED" indication one per Zone.
- "BREAK IN WIRING" indication one per zone.
- "MAINS ON" indicating lamp
- "SYSTEM ON" indicating lamp
- "MAINS FAILURE" indication
- "BATTERY LOW" indication
- "STANDBY ON" indication

12. BATTERY AND BATTERY CHARGER

Adequately rated 24 volt lead acid rechargeable DC battery with 12 hour autonomy shall be provided for the System. The capacity shall be such as to feed the full load of the Fire Detection System including the Illuminated Signs in the event of a mains failure. It shall be connected to the MCP via a mains failure relay.

The battery shall be complete with a Battery trickle charger set and shall be maintained in a charged condition with the constant trickle charge. It shall be possible to boost the charging of the battery by the manual operation of the trickle/boost toggle switch when 'Battery Low' indication is observed on the Main Control Panel.

The Battery capacity shall fully meet the requirements of Clause 5.2 of IS 2189.

13. WIRING

The wiring for the Fire Detection System shall in general comply with the requirements of IS 2189 : 1976 and IS 732 : 1963. The Detectors in each loop shall be wired upto the Main Control Panel with a 2 core 1.5 sq. mm. copper conductor or 2 core 2.5 sq mm aluminium conductor FRLS PVC insulated 660/1100 volt grade wires in concealed or surface conduit as required. Crimped terminations shall be used throughout the System.

14. TEST CERTIFICATES

Type test certificates from a recognized independent agency shall be furnished for all the equipment. The equipment shall comply to the requirements of the Indian, International Standards, Fire Insurance Authorities and all National and Local Regulations in force.

15. SENSITIVITY ADJUSTMENTS

The sensitivity of all Detectors shall be set/adjusted by the Supplier to suit the site conditions.

16. INSTALLATION, COMMISSIONING AND ACCEPTANCE TESTS

The following installation, commissioning and acceptance tests shall be conducted by the Contractor and shall be apart from the Standard/Routine tests prescribed and normally conduc- ted by the Supplier. These tests shall be carried out as a part of the installation irrespective of whether or not these are covered by the Standard/Routine tests.

INSTALLATION TESTS

- After installation of the Detector Bases and prior to installation of the Detectors, the wiring shall be tested for continuity and insulation resistance. A high voltage insulation meter 500 to 1000 volts shall be used to measure the insulation resistance between each conductor and between each conductor and earth. The value of insulation resistance shall not be less than 1 Mega ohm.
- The insulation resistance of the wiring to the Response Indicators shall also be checked as above prior to the installation of the Indicators.

COMMISIONING AND ACCEPTANCE TESTS

- Each zone shall be tested by a test fire or by a heat source on all or any one or more of the Detector selected by the Engineer in Charge. The time required for detection shall be noted and shall be within prescribed limits.
- Each alarm circuit shall be energised separately and the sound level reading taken to check for conformity with the minimum standards.
- Open circuit and removal of a Detector from a detection circuit shall be tested.
- Short circuit operation for each detection circuit will be tested.
- Tests to prove satisfactory operation of the system shall be conducted simulating the conditions of

  * Mains Failure

  * Battery disconnection

* Open circuit and short circuit conditions of each alarm circuit The results of all the tests conducted shall be so recorded and approved by the Engineer in Charge prior to acceptance of the System.

17. **AUTHORITIES AND APPROVALS**

The work shall conform to the requirements and provisions of the relevant Government Acts, Regulations and Bye Laws of the Local Authorities. The Contractor shall give all notices as required under the said Acts, Regulations and Bye Laws.

The Contractor shall submit applications, drawings etc. as required and obtain approval, licenses and sanctions thereof from Delhi Fire Services and any other Statutory Authorities. The Contractor shall obtain the final completion certificate from the concerned authorities to enable the Engineer in Charge to commission the installation.

The Contractor shall be responsible for the payment of all fees etc. to be paid to the relevant Authorities and the Engineer in Charge shall refund the same to the Contractor on submission of receipts in original.

The work shall not be deemed to be complete until the above approvals, licenses, sanctions etc. have been obtained by the Contractor.

14. SPECIFICATION FOR 11000 V SWITCHGEAR

1.00.00 DESIGN CRITERIA

1.01.00 The switchgear will be used to receive the supply at 11KV & feed 1 No. Step down transformers 11KV /0.433&.660 kV for catering to misc. load and for drives. This drives shall be assisted start type.

1.02.00 Switchgear rating and quantities are detailed in the enclosed bill of quantity. Equipment shall be furnished in strict accordance with the same type of switchgear.

1.03.00 For continuous operation at specified ratings, temperature rise of the various switchgear components shall be limited to the permissible values stipulated in the relevant standards and/or this specification.

1.04.00 The switchgear and components there of shall be capable of withstanding the mechanical forces and thermal stress of the short circuit current without any damage or deterioration of material.

1.05.00 The feeders should have appropriate relays and indications for transformer protection from high winding temperature, high oil temperature, tripping and alarming from bucholz relay etc.

2.00.00 SPECIFIC REQUIREMENTS

2.01.00 Construction

2.01.01 The switchgear shall be indoor, metal-clad, floor mounted, drawout type. Design and construction shall be such as to allow extension at either end.

2.01.02 The switchgear enclosure shall confirm to the degree of protection IP 42. The minimum thickness of sheet steel used shall be 2mm front doors & partitions.

2.01.03 The switchgear assembly shall comprise continuous, dead-front line up of free sanding, vertical cubicles. Each cubicle shall have a front hinged door with latches and a removable back cover. All covers and shall be provided with neoprene gaskets.

2.01.04 Switchgear cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to TEST position. The working zone shall be restricted within 250 mm to 2000 mm from floor level.

2.01.05 Circuit breakers, instrument transformers, busbars, cable compartment etc. shall be housed in separate compartments within the cubicle. The design shall be such that failure of one shall not affect the adjacent unit / equipment.

2.01.06 All relays, meters, switches and lamps shall be flush mounted on the respective cubicle door or on control cabinet built on the front of the cubicle.

2.02.00 BUS AND BUS TAPS

2.02.01 The main buses and connection shall be of high conductivity aluminium/aluminium alloy, sized for specified current rating with maximum temperature limited to 85^0C i.e. 35^0C rise over 50^0C ambient suitable for 1250 Amps.

Bus bars shall be designed for a maximum current density of 0.8A/sqmm.

2.02.02 All bus connection shall be antioxide greased. Adequate contact pressure which should be ensure by mean of two bolt connections with plain & spring washers and locknuts.

Bimetallic connectors shall be furnished for connections between similar metals.

2.02.03 Bus-bars and connections shall be fully insulated for working voltage with adequate phase/ ground clearances. Insulating sleeves for bus-bars and cast-resin shrouds for joints shall be provided.

Bus insulator shall be flame-retardant, track resistant type with high creepage surface.

2.02.04 All buses and connections shall be supported and braced to withstand stress due to maximum short circuit and also to take care of any thermal expansion.

2.02.05 Bus-bars shall be sleeved in colour coded manner for easy identification and so located that the sequence R-Y-B shall be from left to right, top to bottom or front to rear, when viewed from front of the switchgear assembly.

2.02.06 The bus-bar chamber shall be provided with inter panel barrier with epoxy cast seal-off bushing through which the buses will pass through so as to prevent fire from one panel to another.

2.02.07 All buses and connections shall be supported and braced to withstand stress due to maximum short circuit and also to take care of any thermal expansion.

2.03.00 CIRCUIT BREAKER

2.03.01 Circuit breaker shall be triple pole VCB Type.

2.03.02 Circuit breaker shall be drawout type, having SERVICE, TEST AND DISCONNECTED position with positive identification for each position.

2.03.03 Circuit breakers of identical rating shall be physically and electrically interchangeable.

2.03.04 Circuit breaker shall have motor wound spring charged trip mechanism with anti-pumping feature and shunt trip. In addition, facility for manual charging of spring shall be provided alongwith manual charging handle & operating handle.

2.03.05 For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open-closed-open operation of the circuit breaker shall be possible after failure of power supply to the motor.

2.03.06 Mechanical safety interlock shall be provided to prevent:-

b.) The circuit breaker from being racked in or out of the service position when the breaker is closed.

c.) Racking in the circuit breaker unless the control plug is fully engaged.

2.03.07 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

2.03.08 Each breaker shall be provided with an emergency manual trip, mechanical ON/OFF, indication, an operation counter and mechanism charge/discharge indicator.

2.03.09 Each breaker shall be provided with following:-

a.) Auxiliary switch, with 6 NO +6 NC contacts, mounted on the drawout portion of the switchgear.

b.) Position/cell switch with 4 NO + 4 NC contacts one each for TEST and SERVICE position.

2.04.00 CONTROL INDICATION

The circuit breaker shall be wired up for local operation. Each breaker cubical shall be equipped with following:-

2.04.01 One (1) TEST-NORMAL-SERVICE selector switch stay put type with pistol grip handle and key interlock.

2.04.02 Two (2) heavy duty oil tight, push buttons for trip & close.

2.04.03 Three (7) indicating lights on front of compartments:-

GREEN:	Breaker open and spring charged
RED:	Breaker closed
AMBER discrepancy:	Trip/Trip circuit trouble & in closing arrangement.
WHITE:	Control supply available/ failure.
Phase Indication	One Red, One Blue & One Yellow

2.04.04 Lamps shall be LED type; lamp and lens shall be replaceable from the front.

2.04.05 The general scheme of connection for control, interlock and protection will be intimated later to the successful bidder, who shall develop and furnish the schemes accordingly.

2.05.00 CURRENT TRANSFORMER

2.05.01 Current transformers shall be cast resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connections will be made.

2.05.02 Accuracy class of the current Transformers shall be:-

- Rating As per BOQ
- Class 5P10 for other relaying (protection).
- Class 1.0 and ISF< 5 for metering.

2.05.03 The burden of CT shall be of 15 VA.

2.06.00 VOLTAGE TRANSFORMER

2.06.01 Voltage transformer shall be of cast- resin 50VA burden, drawout type and shall have an accuracy class of 1.0 Voltage Transformer mounted on breaker carriage is not acceptable.

2.06.02 High voltage windings of voltage transformer shall be protected to current limiting fuses. The Voltage transformer and fuses shall be completely disconnected and visibly grounded in fully draw-out position.

2.06.03 Low Voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the switchgear is energized.

2.07.00 RELAYS

2.07.01 Relays shall be of draw-out design with built-in testing facilities. Small auxiliary relays may be in non-draw-out execution and mounted within the cubicle.

2.07.02 Relays shall be rated for operation on **24 V DC** secondary voltage and 5A secondary current as shown on drawing. Number and rating of relays contacts shall suit the job requirements.

2.07.03 The contractors shall furnish, install & co-ordinate all relays to sum the requirements of protection, as broadly indicated in bill of quantity and specifications.

2.08.00 METERS (Digital Display)

2.08.01 Indicating instruments of shall be digital switchboard type and accuracy class of +/-2%.

2.08.02 Digital Watt-hour meter shall be provided. Alternatively, they may have test block to facilities testing of meter without disturbing C.T. or P.T. secondary connections.

2.08.03 Each breaker shall be with digital volt meter, digital amp meter with selector switches & digital KWH meters.

2.09.00 SECONDARY WIRING

2.09.01 The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, transfer and interlocking schemes.

2.09.02 MCB links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired upto terminal blocks.

2.09.03 Wiring shall be done with flexible, 650V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 sqmm for control and current circuits and 1.5sqmm for voltage circuits.

2.09.04 Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractor's wiring diagrams.

2.09.05 Wire termination shall be made with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

2.10.00 TERMINAL BLOCKS:-

2.10.01 Terminal blocks shall be 660V grade box-clamp type with marking strips ELMEX 10 sqmm or equal. Terminals for C.Y. secondary leads shall have provision for shorting.

2.10.02 Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

2.10.03 Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

2.11.00 CABLE TERMINATION:-

2.11.01 Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for case of termination and connection.

2.11.02 Power cables shall be XLPE insulated, armoured, overall PVC sheathed with stranded aluminium conductor. Control cables shall be PVC insulated armoured, overall PVC sheathed with 2.5 sqmm stranded copper conductor.

2.11.03 All provision and accessories shall be furnished for termination and connection of cables, including removable gland, plates, cables supports, crimp type tinned copper/aluminium lugs, brass compression glands with tapered washer (power cables only) and terminal blocks.

2.11.04 The gland plates to be minimum 4 mm thick. The gland plate cable and supporting arrangement for I/C power cables shall be such as to minimize flow of eddy current.

2.11.05 Sufficient space shall be provided between the power cable termination (end boxes) and gland plate, core balance C.T.s, wherever specified, shall be accommodated within this space.

2.12.00 GROUND BUS:-

2.12.01 A ground bus, rated to carry maximum fault current, shall extend full length of the switchgear.

2.12.02 The ground bus shall be provided with two-bolt drilling with GI bolts & nuts at each end to receive 50x6mm GI flat.

2.12.03 Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker and drawout V.T. unit shall be grounded through heavy multiple contacts at all time except when the primary disconnecting drives are separated by a safe distance.

2.12.04 Whenever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be ran independently to the ground bus and connected there to.

2.12.05 C.T. and V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing other.

2.13.00 NAMEPLATES:-

2.13.01 Nameplates of approved design shall be furnished at each cubicle and at each instruments & design mounted on or inside the cubicle.

2.13.02 The material shall be lamicoid or approved equal, 3mm thick with white letter on black back ground.

2.13.03 The nameplates shall be held by self-tapping screws. Nameplates size shall be minimum 20x75mm for instrument/device and 40x150mm for panels.

2.13.04 Caution notice on suitable metal shall be affixed at the back of each vertical panel.

2.14.00 SPACE HEATERS AND PLUG SOCKETS:-

2.14.01 Each cubicle shall be provided with thermostat controlled space heaters & 5A, 3 pin plug socket.

2.14.02 In addition, motor feeder cubicle shall be wired-up for feeding the motor space heater through suitable rated breaker auxiliary NC contact and/or contactor.

2.14.03 Cubicle heater, motor heater, plug/socket circuits shall have individual MCB units.

2.15.00 AC/DC POWER SUPPLY:-

2.15.01 The following power will have to be made available to each switch gear:
A.C. supply; Two single phase feeders

From these two single-phase feeder a reliable 240V, 1 ph AC bus shall be obtained by providing auto change over switch scheme & bus will be run all along the switchgear. The necessary equipment for this scheme is to be supplied by the contractor.

The DC supply required for control purposes is to be obtained from main DC rectifier arrangement which will convert the 240V AC supply to 24 V DC. The necessary equipment for this scheme is to be supplied by the contractor.

2.15.02 Isolating MCB units shall be provided at each switchgear for the incoming supplies, 2-pole, single throw for A.C. & 2-pole, double throw for D.C.

2.15.03 Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating MCB units shall be provided at each cubicle for A.C./D.C. supplies.

2.15.04 A.C. load shall be so distributed as to present a balance loading on three-phase supply system.

2.16.00 PAINTING:-

2.16.01 All surfaces shall be sand blasted, pickled & grounded as required to produce a smooth, clean surface free of scale, grease & rust.

2.16.02 After cleaning, the surface shall be given a phosphate primer & stoved after each coat. 6.18.03. The switchgear shall be finished in light gray (IS shade # 631) with two coats of synthetic enamel paint.

2.16.03 Sufficient quantity of touch-up paint shall be furnished for application at site.

2.17.00 ACCESSORIES:-

Earthing equipment suitable for earthing the bus or outgoing cable shall be furnished alongwith the switchgear.

3.00.00 TEST:-

3.01.00 The switchgear shall be completely assembled, wired, adjusted & tested at the factory as per the relevant standards.

3.02.00 Routine Test:-

The tests shall include but not necessarily limited to the following:-

a.) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme & proper functioning of the equipment.
b.) All wiring & current carrying part shall be given appropriate high voltage test.
c.) Primary current & voltage shall be applied to all instrument transformers.
d.) Routine test shall be carried out on all equipment such ass circuit breakers, instrument transformers, relays, meters etc.

3.03.00 Type Test:-

A copy of the following type test certificate shall be supplied before offering the equipment.

a.) Impulse test
b.) Temperature rise test
c.) Short circuit test.

3.04.00 Test Witness:-

All acceptance tests shall be performed in presence of Authority's representatives, if so desired by the Authority. The contractor shall given at least fifteen (15) days advance notice of the date when tests are to be carried out.

3.05.00 Test Certificate:-

3.05.01 Certified reports of all the tests carried out at the works shall be furnished in three (3) copies for approval of the authority.

3.05.02 The equipment shall be dispatched from works only after receipt of Authority' s written approval of the test reports,

3.05.03 Type test certificate on any equipment , if so desired by the authority, shall be furnished,. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

4.00.00 SPECIAL TOOLS & TACKELS

4.01.00 A set of special tools and tackles which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.

4.02.00 The tools shall be shipped in separate container , clearly marked with the name of the equipment for which they are intended.

5.00.00 DRAWING , DATA & MANUALS:-

5.01.00 To be furnished for approval after award of work

a.) General arrangement drawing showing constructional features , space required in front for withdrawals, power & control cable entry points etc.
b.) Details of materials with specifications.

c.) Typical foundation plan and loading.

d.) Typical breaker control schematic diagram..

e.) Matching flange & terminals for the bus termination.

f.) Type test reports on circuit breaker.

g.) Technical leaflets

i) Circuit Breaker
ii) Instrument transformers
iii) Relays, meters, switches etc.

h.) Single line diagram

i.) Control schematics
j.) Wiring diagrams

5.02.00 Instructions manuals of switchgear & individual equipment.

The manual shall clearly indicate that the installation method, checkup & tests to be carried out before commissioning of the equipment.

5.03.00 The bidder may note that the drawings, data & manuals listed herein are minimum requirements only. The bidder shall ensure that all other necessary write-ups, curves & information required to fully describe the equipment are submitted with his bid.

CIRCUIT BREAKER

Make	:	As per approved make
Type	:	VCB
Rated Voltage	:	12 kV
Rated Frequecy	:	50 Hz
Rated Current	:	1250 Amp
No. of pole	:	3
Aux. Voltage for trip/ close coil	:	24 V DC
Voltage for spring charging motor	:	240 V AC
Incoming and outgoing panel	:	1

6.00.00 PROTECTION (FOR H.T. SUPPLY 12 KV PANEL)

The protection to be provided for different type of circuits are listed below-

6.00.01 SPAJ 140 C (INC-1& FDR-1)
6.00.02 VAX31 Trip circuit supervision relay (INC-1& FDR-1)
6.00.03 VAA11 Auxiliary relay-DC supply supervision
6.00.04 VAJH13 Tripping relay (INC-1& FDR-1)
6.00.05 255 aux relay(WTI, OTI, Buclz, Oil level) (FDR-1)

All inverse time O/C relay shall be of 3 sec. Version. All definite time O/C relay shall have adjustable time range of 0-6 sec.

A part from protection relay's each & every breaker shall be provided with auxi. Contact multiplier relay, anti-pumping relay, trip supervision relay, lockout relay, test terminal block. These relay shall be hand reset.

15. TECHNICAL SPECIFICATION OF 1010 KVA DG SET

The indicative technical specifications will be as followed. The TDS/ BOM sheet as per the approved makes have to be approved by Competent Authority before order is placed for procurement.

1. Supplying , Installing , Testing, and Commissioning of 1010 kVA (808 kW) CPCB IV+ Prime power/ Duty with hospital grade silencer Type, Radiator cooled, standard Diesel Generator (D.G.) set consisting of Diesel ENGINE coupled with 1010 KVA, 415V, 50 Hz, ,3 phase, 1500 rpm and 0.8 Power Factor (P.F.) lag, IP 23 ALTERNATOR mounted on a common base/ frame including Acoustic Enclosure, residential Silent Type silencer along with other standard accessories i.e. AVM pads, fuel filter, lube oil filter, water separator, 1st fill of lube oil, coolant, batteries with leads, Microprocessor based digital Controller etc., Clearance /approval for complete installation from CPCB/State pollution control board, Central electricity authority (ECA)/Local bodies and other licencing authorities, wherever required, comply with ISO- 3046 & ISO-8528 standard and consisting of the followings and as per specification.

(a) Diesel Engine: Turbocharged Diesel engine of min. output 1180 BHP/ higher at 1500 RPM,50Hz as per ISO 8528 suitable for 1010 KVA output of the alternator as per site condition capable of taking 10% overloading available in the excess of specified output for one hour in every 12 hours. Having 12 no V type cast iron cylinder, Cast iron cylinder block with rugged body construction, 15.7:1 Compression ratio ,150x150 mm bore & stroke, 4 stroke, Distribution, radiator cooled, electronic start with accessories, First fill of lube oil, coolant etc. The engine shall be confirm to IS; 10000/ ISO 3046/ BS;649/BS 5514 amended upto date.

(b) Base Frame: Cast iron cylinder block with rugged body construction Both the engine and alternator shall be mounted on suitable base frame made of MS channel with necessary reinforcement, Hardened steel forged crankshaft with induction hardened which shall be installed on existing cement concrete foundation and vibration isolation arrangement as per recommendation of manufacturer.

(c) Fuel Tank: Daily service fuel tank of 990 litres capacity fabricated out of 3 mm thick M.S. sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS class 'C' pipes of suitable dia. Complete with valves, level indication & accessories as required as per specification including erection etc. complete.

(d) Exhaust System: Dry exhaust manifold with Hospital grade exhaust silencer and catalytic convertor.

(e) Acoustic Enclosure: Acoustic and weather proof Integrated enclosure, sound proofing with high quality/density rock wool/mineral wool cover with fibre glass cloth and perforated powder coated MS Sheet, High quality EPDM gasket with arrangement for fresh air intake for cooling of the engine & alternator, extraction, discharging hot air in to the atmosphere as peer specification as per latest CPCB norms.

(f) Battery: Batteries and leads as required Starting System 24V DC starting system comprising of suitable starter motors: voltage regulator and arrangement for initial excitation complete with suitable of batteries, connecting leads & terminals, stand with SMPS/equiv. battery charger for self excitation with boost and trickle charging facility etc. complete in all respects

(g) Alternator: Alternator IP 23 air cooled Synchronous alternator rated at 1010 KVA, 415V, 50 Hz, ,3 phase 4 wire,4-pole, 50 Hz, AC Supply with 0.8 lagging power factor at 40 degree C , 50% RH & at 1000 Meter MSL. with class-H insulation, The alternator having permanent lubricated sealed bearing, SPDP enclosure, brushless, continuous duty, self-executed and self-regulated through solid state AVR confirming to IS: 4722 suitable for tropical condition i/c safety of under/high voltage, under frequency etc and with space heater, battery charger for self-excitation with boost and trickle charging facility etc. complete in all respects as per IS: 4722 & IEC 34. complete as required.

(h) DG Control/ Instrument Panel: Engine mounted IP-65 microprocessor-based Instrument/ control

Panel, control cables etc having following specification & operating /metering feature.

(i) Operating feature: AMF Ready type, LCD Display, incorporate both engine and alternator, Local, remote Start-stop switch with key etc.

(j) Display & metering feature: Water, coolant temperature indication, Lubrication oil pressure & temperature indication, Battery charging, voltage indication, Fuel level indication%, Over/under speed indication, Engine running hours & RPM indication.

(k) Electrical Parameter: Generator Voltage (Ph-Ph),(Ph-N),Current (R,Y,B), Generator power (Kw), Cumulative Generated energy units (KWh), frequency (Hz) etc.

(l) Engine Protection: High water temperature, Low oil Pressure, Low fuel level, Over/under speed, Engine fail to start, Over/under voltage & frequency etc..

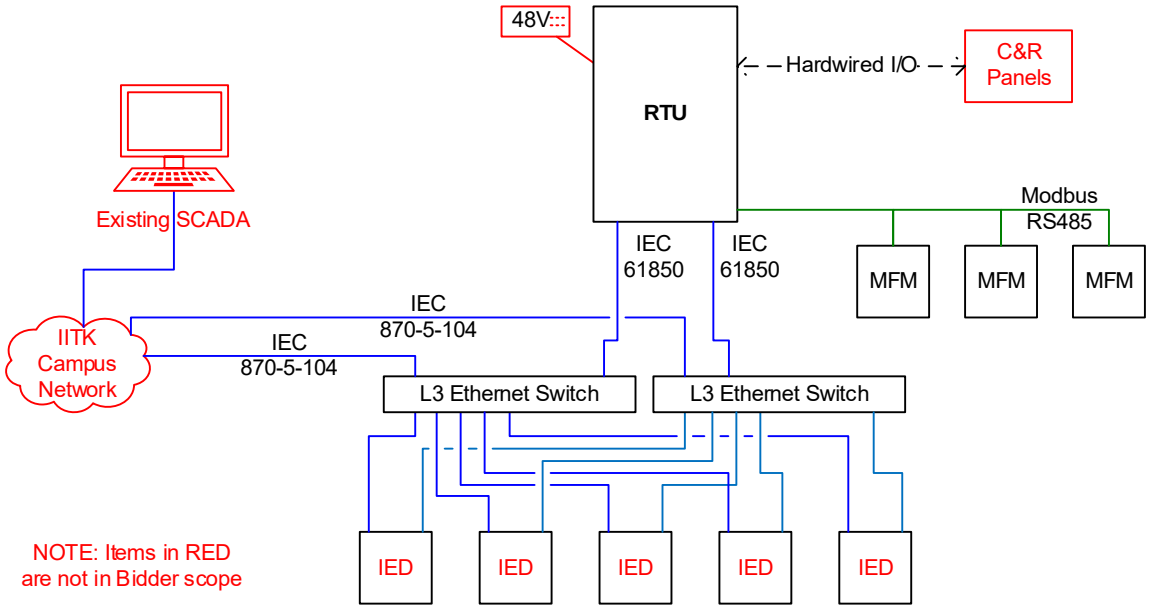
(m) Testing of DG Set: The DG set shall be tested in the works of the manufacturer and necessary test certificate shall have to be furnished in presence of the IIT Kanpur representative and the contractor . The DG set shall be operated for 12 hours at full load including 10% over load for one hour. The department may witness the testing after installation of DG set at site, the DG set shall be operated for 4 hours continuously at available load and all function shall be verified. POL for site testing shall be arranged by the contractor within the quoted rates.

2. Supplying, installation, testing and commissioning of Synchronization Panel suitable for 3 set of 03 Nos 1010 kVA DG sets Aluminium busbar, auto sync & load sharing relay, PLC panel, standard metering communicable type with RS-485, indicating lamps & push buttons complete as required with Automatic start/stop of Engine, Automatic load sharing, and Bach up protection (O/L , S/S, Reverse power, Reverse KVAR, Under voltage, Over voltage, Under frequency, Over frequency, synchro-check & Earth fault) as per TDS/ BOM sheet approved by Engineer-in-Charge/ Competent Authority. Indicative list of components with type, preferred make and quantity for the Sync. panel the engine controller(s) of DG sets

3. Installation of DG Set: The DG set will be installed on RCC foundation, with vibration, Isolation pads to be provided to prevent transmission of vibration to the building structure. The quoted rate should be inclusive of the cost of foundation of DG set.

16. SCADA integration of 33/11 KV & 11/.433 KV SS with existing IIT K SCADA as per BOQ defined.

System Architecture (Indicative for 33/11 KV SS)



BOM

S. No.	Item	Qty.	Units
1.	RTU as per Technical Specifications suitable for New 33/11kV Substation including cabling	1	Nos.
2.	Class 0.2S Multifunction Meters	18	Nos.
3.	Transformer Tap Position Transducers	2	Nos.
4.	Transformer OTI+WTI Transducer	2	Nos.
5.	L3 IEC61850-3 Ethernet Switches (12 Copper + 6 Fiber)	2	Nos.
6.	Cat6 cabling + LIU + Patch Cords	1	Lot
7.	GPS Master Clock	1	Nos.
8.	RTU Programming, Diagnostics Software	1	Nos.
9.	Integration, Testing, and Commissioning of RTU	1	Job
10.	Integration of RTUs with Existing SCADA	1	Job
11.	Merging Units with 5 CT, 5 VT, 24 BI, 20 BO, ethernet RJ45	4	set

Scope of Work

Scope of work for this project is defined as follows –

- Functional design specifications of the offered system to meet the requirements of the project
- Factory Acceptance Test (FAT) for supplied equipment and software
- Packing, transit insurance and transportation of items as per Bill of Material
- Supply of equipment and software licenses as per Bill of Material
- Supply, Laying of control and monitoring cables for signals, communications, etc.
- Testing and Commissioning of offered system
- Integration of offered system with existing SCADA at IITK including any modifications at SCADA end
- Integration of communicable protection relays with RTU and reporting at SCADA
- As-built documentation for the entire system
- Warranty on offered equipment as per terms indicated

17. SPECIFICATION FOR THE ELECTRICAL INSTALLATION WORK

The following specifications will apply under all circumstances to the equipment to be installed against this contract and it is to be ensured that the contractor shall obtain for himself at his own expense and on his own responsibility all the information which may be necessary for purpose of making the tender and for entering into a contract keeping in view the specification and inspection of site etc.

The tendered rates shall include for the cost of material erection, connection, commissioning, labour, supervision, tools, transport all taxes, contingencies, breakage, wastage, sundries, scaffolding, maintenance of installations for defect liability period i.e. they should be for an item complete in all respects.

The general specifications of electrical works for internal and general specifications for Sub-station works- of CPWD shall be followed.

1. SITE CONDITIONS: the equipment to be erected and commissioned should be suitable for the site conditions, it is estimated that the maximum temperature as site will be 50ºC.

2. L.S.SPECIFICATIONS:

The following Indians standard specifications will apply to the equipment and the contract unless specified otherwise.

a) Transformer	IS 2026-1977 & 1981
b) Low tension air-circuit breakers and MCCB	IS 2516-1965
c) Switch fuse unit on cubicle switch boards etc.	IS 4047-1967
d) Switch fuse unit on industrial boards etc	IS 4064-1967
e) Switch gear bus bars	IS 375-1963
f) HRC fuse links	IS 2208-1962
g) Distribution fuse boards	IS 2675-1966
h) Degree of protection provided by enclosure For low voltage switchgear	IS 2147-1962
i) PVC cables.	IS 1954-1962
j) 11,000 volt paper insulated lead sheathed cables	IS 692-1965
k) Tubular fluorescent lamps for general lighting Service.	IS 2418-1965
l) Tungsten filament lamps for general service.	IS 418-1963
m) Ceiling fans	IS 374-1966
n) Flood light	IS 1947-1961
o) Well glass flame proof electric light fitting	IS 2206-1962 Part-I
p) XLPE cables	IS 7098-Part-II
q) Industrial light fittings with metal reflectors.	IS 1971-1961
r) Water tight electric light fittings	IS 3533-1966
s) Fittings for rigid steel conduits	IS 2667-1964
t) Rigid steel conduits for electrical wiring	IS 1958-1964
u) Accessories for rigid steel conduit for electrical Wiring.	IS 3873-1966
v) Switch socket outlets.	IS 4615-1963
w) Three pin pug and socket outlets`	IS 1233-1967
x) Switches for domestic and similar purpose	IS 3858-1966
y) AC electricity meters	IS 722-1977/1980+86

CODE FOR PRACTICE

Earthing	IS 3043-1966
Electrical wiring installations	IS 732-1963
Lighting protection	IS 2309-1969

18. List of Approved Makes for Electrical Works

S. No.	*Items*	*Makes*
1	*MS Conduit (ISI marked)with heavy duty accessories*	*BEC/AKG/ RM CON /Steel Krafts*
2	*PVC/ XLPE insulated aluminium / copper conductor armoured unarmoured MV cables upto 1100 V(ISI Marked)*	*Havells / Finolex/ KEI/ Grandlay/ Polycab/Gloster*
3	*FRLS PVC insulated copper conductor stranded flexible wire i/c control cables(ISI Marked)*	*Havells/Finolex/KEI/ Grandlay/Polycab/Gloster*
4	*Cable Raceway floor/wall mounted and accessories*	*Legrand / MK (Honeywell) / OBO/Excel*
5	*Cable Tray & Accessories*	*Venus / MEM / BEC / RM CON/ Indeana/Excel*
6	*Modular Switch & Socket & Accessories*	*Legrand(Myrus)/M.K. (Element) /Schneider (Zencelo) / legrand (Arteor)/ ABB*
7	*Metal clad Industrial Socket outlet and sheet steel Enclosure for MCCB/ MCB*	*Legrand/Siemens/Schneider/Hager*
8	*Cable Glands*	*Dowells/Commet/Gripwell/Raychem*
9	*Lugs and end termination*	*Dowells/Commet/Braco*
10	*Change over switch*	*L&T / Socomac / ABB / Schneider*
11	*Distribution Boards*	*Siemens (Betagard), / Hager / Schneider (Acti9) / Legrand (Ekinox3[3]/ L&T (Exora / ABB (Elegence)*
12	*Protection Device (MCB/RCCB/RCBO/ELCB)*	*Siemens (5SL), Hager / Schneider (Acti9) / Legrand (DX 3) / ABB (S200M) / L&T*
13	*Current transformer / potential transformer*	*AEL / Gilbert & Maxwell / Pragati / Precise / L&T/ Kappa/Kalpa*
14	*Indicating Lamps LED type, Push Button*	*Siemens / L&T / Schneider / Legrand*
15	*Electronic Digital Meters*	*Schneider (conzerv) / L&T / Secure / Siemens / ABB / Legrand*
16	*MCCBs*	*Siemens (3VL) / L&T (D sine) / Schneider (CVS) / Legrand (DPX3) ABB (T max)*
17	*Power Contactor*	*L&T (MNX)/ Schneider (Tesys) / Legrand (CTX[3]) ABB (Ax)*
18	*Surge Protection Devices*	*Siemens/L&T/Schneider / Legrand/ OBO/DEHN*
19	*Selector Switch*	*Salzer/Seimens /BCH/ Kaycee / L&T*
20	*Auxiliary Relays*	*Siemens/L&T/Schneider/Legrand/ABB*
21	*LED Lighting Fixture*	*Philips/ Wipro/Havells/Crompton*
22	*Emergency Lighting/ Exit Sign boards*	*Bajaj / Prolite / Glo-Line*

23	*Ceiling Fan, Fresh Air Fan, Exhaust Fan*	*Havells/Crompton/ Usha / Orient/ Atomberg*
24	*Paint*	*Nerolac/Asian/Berger/ICI*
25	*Lighting Protech System*	*OBO/ Cape Electric/ Infinite / APS/ Jeff Techno/ Axis/DEHN*
26	*G.I Pipe*	*Tata, Jindal-Hissar, Prakash Surya*
27	*Rubber Mat (ISI Marked)*	*Jyoti / Deep Jyoti/ Premier*
28	*Fire Extinguisher*	*Minimax/ Life Guard / Cease Fire / Newage*
29	*CU/ GI Strip & GI wire for earthing*	*Jeff Techno/ Axis / OBO*
30	*MS Conduit (ISI marked)*	*BEC/AKG/NIC/ Steel craft/ M-Key, SK (E.R.W)*
31	*PVC Conduit and accessories*	*Polycab/ AKG / Asian*
32	*1.1 KV aluminium armoured XLPE insulated and PVC sheathed cable (LT cable)*	*Havells /KEI/ Finolex/ Grandlay/ Gloster*
33	*Modular Switch & Socket*	*Legrand (Myrus) MK (Element) Schneider (Zencelo India) / Havells/ ABB*
34	*Metal Clad Industrial Socket*	*Legrand / Siemens/Schneider/ C&S/ ABB*
35	*Cat-6 cable*	*Beldon/Siemon/Legrand/Penduit (Pannet)*
36	*Crimp Patch Cord*	*Beldon/Siemon/Legrand/Penuit (Pannet)*
37	*Panel Accessories*	*Siemenss/ L&T/ Schneider / Legrand / Tecnic/ ABB/ C&S/ Neptune*
38	*LED/ Metal Halide / Fluorescent Internal Lighting Fixtures*	*Philips/ Wipro/Havells/Crompton*
39	*External Lighting Fixture*	*Philips/ Wipro/Havells/Crompton*
40	*Ceiling Fan (ISI marked & BEE rated 5 star)*	*Havells / Almonard/ Orient/ Usha/ Bajaj*
41	*Advance lighting protections System (Early Streamer Emission Type)*	*LPI (Australia)-by allied power/ SGI (Duval Messien/ Satellite(France) by SGI/ Bradlay (USA) -by JMV/ Erico (USA) by security shoppe/ ABB/DEHN*
42	*Main LT Panels/ MCC Panel*	*(Main LT panel / MCC Panel board should be IEC 61439 part-1 and II manufacturer has to produces the relevant test certificate as per IEC code for the same failing which panel shall be rejected). L&T /Siemens / Schneider/ ABB/ Legrand or their authorized channel partners for IEC 61439 compliant panels*
43	*Air Circuit Breaker*	*Siemens / Schneider/ L&T/ Legrand/ ABB/CGL*
44	*Surge Voltage Protection*	*Siemens/L&T/Schneider / ABB*
45	*Earth fault module*	*Siemens/Schneider/L&T/Legrand*

46	*Protection relays*	*Siemens/ Areva/ L&T/ Legrand*
47	*C.Ts and PTs*	*Kappa / AE/ Matrix/KALPA*
48	*Digital Meters*	*Siemens (PAC)/ Schneider/ (conzerv) / Secure Enersol / L&T/ Neptune*
49	*Indicating lamps*	*ESBEE/Schneider/Siemens/Vaishno/Neptune*
50	*Power capacitors*	*Epcos/ Neptune / Legrand /ABB/ L&T*
51	*Automatic Power factor correction relay/controller*	*Epcos/Siemens (PAC) /Schneider (Conzerv)/L&T/Neptune*
52	*Sealed Maintenance Free Batteries*	*Exide/Panasonic/Amara Raja/HBL*
53	*Battery charger*	*Caldyne/Chhabi Electricals/Statcon/Max Power*
54	*Cable Trays (Factory Fabricated/ Overhead & Floor Raceways*	*Legrand/MEM/OBO/ Milestone/ Neptune*
55	*HDPE underground cable duct*	*Rex Polyextrusion/ Tirpura/ Plasomatics/ Duraline*
56	*Insulation Mats*	*DL Miller & Co. Ltd.?Premier Polyfilm Ltd./RMG Polyvinyl India Ltd/Jyoti*
57	*Smoke/Heat detectors*	*Apollo/ System Sensor/ Agni*
58	*Manual Call point*	*PRD/System-Tek/ Simplex/ System Sensor/ Agni*
59	*Response indicators*	*PRD/System-Tek/ Simplex/ System Sensor /Agni*
60	*Fire Exit Signs*	*System-Tek/ Simplex/ Agni*
61	*Fire Control Panel*	*System-Tek/ Morley /Agni*
62	*Speaker / Hooter*	*System-Tek/ Philips /Agni*
63	*Occupancy Sensors/ Movement Sensor*	*Legrand/ Philips/ Wipro*
64	*Flush type switch /socket*	*Anchor/ Kinjal/ SSK/ Havells Reo*
65	*Fuse switches unit / switch fuse unit /HRC fuse*	*L&T / Siemens/ Havells/ C&S*
66	*Exhaust fan*	*Almonard/ Alstom/ Crompton/ Havells*
67	*XLPE insulated HT cables*	*KEI/Havells/Grandlay/Gloster/Polycab*
68	*Cable lug*	*Ascon (Heavy gauge) Jainson Dowells*
69	*Telephone wires/Telephone Cable / jelly filled telephone cables*	*Finolex /Delton/Havell's*
70	*Telephone tag blocks*	*Krone/ Pouyet*
71	*Telephone outlet*	*MK Electric /Legrand (Mosaic)/Crabtree (Piccadilly)*
72	*GI raceways*	*Milestone Engineering /Legrand/ MDS/ Neptune Systems Pvt. Ltd./MK*
73	*PVC raceways*	*Legrand/ MK*
74	*Electronic ballast*	*Philips / Wipro/ Bajaj/ Decon/Crompton/Havells*

75	*DLP plastic trunking*	*Legrand/MK*
76	*Geysers*	*Recold /Venus /Usha Lexus /Sphere hot*
77	*Tower Light*	*Ligman/Simes/Bega*
78	*HT/LT transformers*	*ABB/Schneider /CGL (Crompton Greaves Ltd.)/Siemens*
79	*HT SF-6 circuit breakers / VCB*	*Siemens/ ABB/ CGL / Schneider*
80	*Programmable Logic Controller (PLC)*	*Siemens /Allen-Bradley/ Schneider/ CGL*
81	*Earthing (Chemical Earthing Plate Earthing*	*JMV/ As per CPWD Norms*
82	*Octagonal Pole*	*Bajaj / Crompton / Phillips*
83	*11 kV HT panel Incoming relay(IEC 61850)*	*CGL/Schneider/ABB/ Siemens*
84	*Control Relay Panel*	*CGL/Schneider/ABB/Siemens*
85	*Lightning Arrestor*	*ABB/Alltec/JMV/DEHN*
86	*Temp. Gauge*	*Guru*
87	*Gate Valve*	*Leader/Sant*
88	*Electrical Backup*	*Spare hot/ Racold*
89	*PVC Tank*	*Syntex/ Polycon*
90	*Thermostat*	*ISI Marked*
91	*Flat Collector Plate*	*Solocrome/ Tata BP/ Racold*
92	*S.S Sheet*	*Jindal / National*
93	*HT/LT cable joints (Straight through/outdoor/indoor)*	*3M/ Denson/ M Seal/Raychem/ Cabseal*
94	*Alternator*	*STAMFORD/Crompton Greaves/Kirlosker/Leroy Somer*
95	*DG set engine*	Kirlosker/ Cummins/ Greaves Cotton/Baudouin/Caterpillar/Perkins
96	*DG Set (Preferred makes)*	*Sterling Generator/ Kirlosker /Caterpillar/Cummins Power / Greaves Cotton/Jackson*
97	*Makes of accessories of HT / LT Panel*	*As per standard practice of manufacturer/ L&T /Siemens / Schneider/ ABB/Legrand/Crompton Greaves*
98	*Bus Trunking*	*C&S / CGL/ L&T/ Schneider as per standard practice of OEM manufacturer*
99	*HT panel 11 KV*	*Siemens/ABB/ Schneider/ CGL (Crompton Greaves Ltd.)*
100	*Bus Duct*	*Neptune / Milestone/ Tricolite*
101	*Lamp Holder (Brass)*	*Kay/ SSK/ Kinjal*
102	*UPS*	*APC(Schneider)/Vertiv/ABB/Numeric/Delta/Tmeic*
103	*AMF Panel*	*L&T/ Siemens/ ABB/ Excel Control*
104	*RTU panel*	*Synergy/ Siemens/ Schneider/GE*

19. List of Drawings

S. No.	Name of drawing	Drawing No.
1	Interconnection of new and existing 33/11 KV substation	IITK/IWD/DRWG01
2	Location of 33/11 kV SS	IITK/IWD/DRWG02
3	33/11kV SLD	IITK/IWD/DRWG03
4	Layout of 33/11KV SS	IITK/IWD/DRWG04
5	33/11 KV SS SLD with 11 kv Panel	IITK/IWD/DRWG05
6	33/11 KV SS Control Room Wiring Diagram	IITK/IWD/DRWG06
7	SLD of GSMST 11/0.433 KV	IITK/IWD/DRWG07
8	Layout of 11/0.433 KV Substation & DG of GSMST	IITK/IWD/DRWG08
9	9 x 1010 KVA DG with Exhaust piping	IITK/IWD/DRWG09

APPENDIX I

Undertaking from major equipment OEM's (Original Equipment Manufacturer)

The lowest tenderer shall submit alongwith the performance guarantee after the acceptance of tender, an undertaking from OEM's as at Annexure-1 to 6 regarding major equipment's as mentioned below:

- The Authorization Certificate from Transformer Manufacturer.
- In Annexure 1 for the 2 years defect liability period & 2 years comprehensive warranty of the transformer in favor of IIT Kanpur. The OEM shall un conditionally support the lowest tenderer technically throughout the execution of the contract as well during DLP , comprehensive warranty & non comprehensive maintenance contract period for the useful life of the equipment.
- The OEM shall provide list of all the necessary spares required for healthy functioning of the transformer till the useful life of the equipment.

ANNEXURE – 1

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period of the transformer to the lowest tenderer for 33/11 KV, 10 MVA transformer proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We , OEM for 33/11 KV 10 MVA Transformer do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period & warranty support through M/s……., lowest tenderer for the work, "***Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur".***

1. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software, integrated VFD and any other accessories for running the equipment.

M/s…….

Authorized signatory with

stamp.

ANNEXURE – 2

Original Equipment Manufacturer (OEM) undertaking for ensuring availability of the spare parts throughout the useful life of 11/0.433 KV 2.5 MVA, 1.6 MVA, 0.630 MVA Transformer proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We , OEM for 11/0.433 KV, 2.5 MVA, 1.6 MVA, 0.630 MVA Transformer do hereby give undertaking to IIT Kanpur for the providing service supports and spare throughout the life of the transformer through M/s , lowest tenderer for the work, " Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur".

2. We also give undertaking to provide un conditional support to the lowest tenderer technically throughout the execution of the contract as well during DLP, comprehensive warranty & non comprehensive maintenance contract period for the useful life of the equipment.

M/s…….

Authorized signatory with stamp.

ANNEXURE – 3

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period of the 9 x 1010 KVA DG Sets to the lowest tenderer to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We ……, OEM for DG sets do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period & warranty support through M/s……., lowest tenderer for the work, "***Construction of New 33/11 kV substation & interconnection with existing 33/11 kV substation and supply, installation testing and commissioning of 11/0.433 kV substation (HT side works) and DG sets of GSMST in IIT Kanpur".***

3. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software and any other accessories for running the equipment.

M/s…….

Authorized signatory with stamp.

20 Special Conditions of Contract

20.1 Special Conditions for the minor works under the contract

1. The contract will be used only to execute original works/ minor works/ repair works of urgent nature. It can also be used for any works of restoration as a result of a disaster in campus causing damage to institute infrastructure/ works related to emergency services/ works of institute importance/ works concerned to safety health and environment of campus community. The works undertaken through such contracts are categorized as time bound and should be executed as per Table 6.
2. The contractor should always keep his establishment ready to commence the work im- mediately after the issue of the work of any amount. The schedule for the issued works under the contract should be at per Table 6. Work requests of urgent nature shall be started at the earliest after receiving orders from the engineer-in-charge but it should be documented with photo and video evidence for all hidden items. Submission of this evidence is mandatory for all works executed.
3. During the execution, the noise creation should be minimized to the extent possible and the works may be carried at odd hours and more than one shift as per requirement.
4. The performance of the instruments or tools to be used should be checked precise before using them on site.
5. The contractor and his/her personnel has to build a well- coordinated system with the users regarding execution of the works.

20.2 Timely Completion

1. All work components must be started simultaneously and has to be delivered together or early within the given time schedule.
2. The contractor has to deploy the labor and supervisory staff in shifts to meet the targeted completion date. The work may be executed in extended shifts or two shifts.
3. Number of days from the date of issue of letter of acceptance for reckoning date of start shall be as per Schedule. *If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited.*
4. The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work, as required.

20.3 Rates

1. Unless otherwise provided in the schedule of quantities of the work the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building (Exclusive of GST) and nothing extra shall be payable to him on this account.
2. The rates for all items of work shall, unless clearly specified otherwise, include cost of all labours, materials, testing charges and other inputs involved in the execution of the item irrespective of whether they have been specifically mentioned in the tender document or not.
3. In case the same item (s) appear more than once in the schedule of work / BOQ under the same sub head or among the different subhead of works, the lowest rate quoted for that item (s) shall be considered for the particular item(s) wherever appeared in any part of BOQ / Schedule of

works for the purpose of tender evaluation although web generated e-price bid may incorporate different quoted rate for same item(s) as per the quoting pattern of the tenderer. The tendered amount thus worked out shall be final &shall be binding on the contractor.

4. No double scaffolding is payable in single story houses including parapet wall. In multistor- ied houses the payment of double scaffolding shall be made after 3.5 meter from plinth protected level. The necessary deductions for single scaffolding be made from the items. Contractors are advised to visit the site & quote the rates accordingly.
5. The rates quoted by the contractor will be deemed to be inclusive of any extra expenditure of this reason. The contractor has to increase the manpower or other tools etc. to do the work as per the quantum of work provided to him at his own expenses. Nothing shall be paid on this account.
6. The contractor shall provide at his own cost suitable weighing, surveying and leveling and measuring arrangements as may be necessary at site for checking. All such equipment shall be got calibrated in advance from laboratory, approved by the Engineer-in-Charge. Nothing extra shall be payable on this account.
7. Other agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.
8. All material shall only be brought at site as per program finalized with the Engineer-in- Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.
9. MCCB's, switches, sockets, wires, cable, light fixtures, earthing's and other electrical items covered under the contract should conform to approved manufacturers specifications, where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost.
10. The contractor shall be responsible for the watch and ward / guard of the buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the client department. No extra payment shall be made on this account.
11. The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work, profile, establishment of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, preparatory works, working during monsoon, working at all depths, height, lead, lift and location etc until / unless specified otherwise and any other incidental works required to complete this work. Nothing extra shall be payable on this account.

20.4 Quality and Workmanship

1. The contractor shall be entirely responsible and answerable for all the works done by him regarding quality, adherence to the laid down specifications, terms and conditions, warranty/guarantee etc. and he shall be liable to bear any compensation that may be levied by the department under any of the clauses of the agreement.
2. The materials having ISI mark shall have precedence over the one conforming to IS Specifications.

3. The proposed buildings are Institute housing and quality of work is paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipment to execute the work.
4. Samples of all materials and fittings to be used in the work in respect of brand manufacturer and quality shall be approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.
5. All materials used in the work shall be new and of good quality, conforming to the relevant specifications as per good engineering practice. All the materials proposed to be used in the work should be approved from Engineer in Charge before use in work.
6. Articles bearing BIS certifications mark shall only be used unless no manufacturer has got BIS/ISI mark for the particular material. Any material/fitting whose sample has not been approved in advance and any other unapproved material brought by the contractor shall be immediately removed as soon as directed. Where the make of any particular material is not specified in the Contract document, the material shall be supplied as per makes desired by the engineer-in-charge.
7. It will be the responsibility of the contractor / bidder to ensure use of genuine materials in the work. The department reserves the right to get (any / all materials / components) inspected by the manufacturer or their authorized representatives at any stage of the execution of work. If any of the materials, supplied and used in work is found spurious at any stage, then the department reserves the right to ask the contractor to replace it by genuine one and make suitable recovery till it is done, even if any payment against that material is already made.
8. The contactor should get the make/TDS documents approved before procuring any material at site. The TDS/Make once approved shall not be changed without any valid recorded reasons. No material to be brought and used at site without the prior knowledge & approval of Engineer-in-Charge.
9. The department may ask for any valid document like manufacturer's test certificate, document for purchase of the material, document for import/shipment of imported materials etc. as deemed fit by the engineer-in- charge to ascertain genuinely of material supplied by/used in the work by the contractor. The contractor shall remain bound to submit all

   such documents to the department failing which payment may not be made or if already paid may be recovered/ withheld from subsequent running account payment.
10. All equipment and their components, and all the materials to be used in the work shall be suitable for the environmental conditions at the location of the work.
11. The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.
12. The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.
13. Other Laboratories: The contractor shall arrange carrying out of all tests required under the

agreement through the laboratory as approved by the Engineer-in-Charge and shall bear all charges in connection therewith including fee for testing. The said cost of tests shall be borne by the contractor/department in the manner indicated below.

(a) By the contractor, if the results show that the test does not conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

(b) By the department, if the results conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

If the tests, which were to be conducted in the site laboratory, are conducted in other laboratories for whatever the reasons, the cost of such tests shall be borne by the contractor.

14. Sample of materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.

15. The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.

16. BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate or test certificate from approved testing laboratory to establish that the material produced by the contractor for incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.The contractor shall procure all the materials at least in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.

17. All materials brought by the contractor for use in the work shall be got checked from the Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.

18. The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

20.5 Natural calamity

No payment will be made to the contractor for any damage caused by rain, snow fall, floods, dampness, fire, sun or any other natural cause whatsoever during the execution of work. The damage to the work due to above reason, if any, shall have to be made good by the contractor at his own cost and no claim on this account shall be entertained.

20.6 Safety and Security

1. The contractor has to follow all safety norms as laid down in National Building Code of India.

All the workers shall be equipped with the required safety gadgets while working at site such as ISI marked helmets, Shoes and safety belts, gumboots, gloves etc.The contractor, the authorized representative(s), workmen etc., shall strictly observe orders pertaining to fire precautions prevailing in the area.

2. The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock key system.
3. Contractor will arrange proper metal ladders, M.S. double scaffolding (for working, painting, etc. at higher levels) at his own cost and will take all safety measures like double harness safety belt, mechanized electrically operated platform etc. If it is observed that work is proceeding without adequate safety precautions, work may be stopped by Engineer-in- charge and in such cases, contractor will be solely responsible for delay and its consequences thereof.
4. The contractor shall be responsible for the watch and ward/guard of the buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the department. No extra payment shall be made on this account.
5. The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night speed limit boards red flags, red lights and providing barriers. He shall be responsible for all dangers and incidents caused to existing / new work due to negligence on his part. No hindrances shall be caused to traffic during the execution of the work.
6. It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.
7. The Institute shall not have any responsibility or liability in case of any accident injury to the personnel to the contractor at work site or to the general public at the work site due to mishandling equipment by the personnel of the contractor or any other similar reason. The responsibilities and liabilities for such accidents and incidents shall be borne by the contractor.

20.7 Approach to Site

1. The tenderer shall see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of materials by the contractor, the same shall be provided, improved and maintained by the contractor at his own cost.
2. Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

20.8 Acts and Laws

1. The Contractor shall keep himself fully informed of all acts and laws of the Central & State Governments, all orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules & regulations and bye-laws laid down by Collector / MC etc. and any other statutory bodies shall be adhered to, by the contractor, during the execution of work.
2. The Contractor shall also adhere to all traffic restrictions notified by the local authorities.
3. All statutory taxes, levies, charges (including water and sewerage charges, charges for temporary service connections and / or any other charges, as applicable) payable to such authorities for

carrying out the work, shall be borne by the Contractor.

4. The Contractor shall arrange to give all notices as required by any statutory / regulatory authority and shall pay to such authority all the fees that is required to be paid for the execution of work. He shall protect and indemnify the Institute and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself/herself or by his/her employees or his/her authorized representatives. Nothing extra shall be payable on these accounts.
5. The fee payable to statutory authorities for obtaining the various permanent service shall be borne by the Institute.

20.9 Labour and Laws

1. The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable to the works, at his site office.
2. Huts for labour are not permitted within the premises of the Institute. No extra cost shall be payable even if the contractor provides such accommodation at a place as is acceptable to the local body.

20.10 Nondisclosure Agreement

1. The Agency shall take all precautions not to disclose, divulge and/or disseminate to any third party any confidential information, proprietary information on the Institute business or security arrangements (including but not limited to the Assignment instructions, Schedules and other subsequent Arrangements) and/or business of the Institute. The obligation is not limited to any Scope and the Agency shall be held responsible in case of beach of the confidentiality of Institute's information.
2. If the Agency receives enquiries from Press/Media/Radio/Television or other bod- ies/persons, the same shall be referred by the Agency to Institute immediately on receipt of such queries.

20.11 Indemnification:

1. The agency shall be directly responsible to indemnify the Institute against all charges, dues, claims, etc. arising out of the disputes relating to the dues and employment of the personnel deployed and further for any claim/compensation against all damages and accidents caused due to negligence on the part of the agents, employees and other personnel of the agency.
2. That the contractor shall keep the IITK indemnified against all claims whatsoever in respect of the employees deployed by the contractor. In case any employee of the contractor so deployed enters in dispute of any nature whatsoever, it will be the primarily responsibility of the contractor to contest the same. In case IITK is made party and is supposed to contest the case, IITK will be reimbursed for the actual expenses incurred towards Counsel Fee and other expenses which shall be paid in advance by the Contractor to IITK on demand. Further, the contractor shall ensure that no financial or Any other liability comes on IITK in this respect of any nature whatsoever and shall keep IITK indemnified in this respect.

20.12 Force Majeure:

If at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract is prevented or delayed by reasons of any war, hostility, acts of

public enemy, civil commotion, sabotage, fires, floods, explosion, epidemics quarantine restriction, strikes, lockouts or acts of god (hereinafter referred to as events) provided notice of happenings of any such event, is served by party seeking concession to the other as soon as practicable, but within 21 days from the date of occurrence and termination thereof. Provided the Party satisfies Institute adequately of the measures taken by it. Neither party shall, by reason of such event, be entitled to terminate this contract, nor shall either party have any claim for damages against the' other in respect of such non-performance or delay in performance. Further, the services under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist and the decision of Institute as to whether the services have to resume or not shall be final and conclusive, provided further, that if the performance in whole or in part of any obligation under this contract is prevented or delayed by reason of any such event for a period exceeding 60 days, Institute may at his option, terminate the contract.

20.13 Dispute resolution

1. The institute reserves the right to amend rules whenever and wherever considered necessary and appropriate. The same shall be intimated to the agency in due course.
2. Any dispute arising out of and in relation to this agreement shall be referred to the arbitration by sole arbitrator to be appointed by Director of the Institute. The arbitration would be conducted and governed by and under the provisions of Arbitration Act, 1996 and its amendments. Any legal dispute will be subject to jurisdiction of Kanpur Courts only and no other court shall have the jurisdiction.
3. Any dispute arising out of and in relation to this agreement shall be referred to the arbitration by sole arbitrator to be appointed by Director of the Institute. The arbitration would be conducted and governed by and under the provisions of Arbitration Act, 1996. Any legal dispute will be subject to jurisdiction of Kanpur Courts only and no other court shall have the jurisdiction.

20.14 Arbitration

1. Except as otherwise provided anywhere in this Agreement, if any dispute, difference, the question of disagreement or matter, whatsoever, arises between the parties, as to the meaning, operation or effect of the Agreement or out of or relating to the Agreement or breach thereof, the same shall be referred to a Sole Arbitrator, to be appointment by the Director of the Institute at the time of the dispute.
2. If the Arbitrator, to whom the matter is originally referred, dies or refuses to act or resigns for any reasons from the position of arbitration, it shall be lawful for the Director of the Institute to appoint another person to act as Arbitrator in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by its predecessor, provided both the parties consent to this effect, failing which, the arbitrator shall be entitled to proceed on the matter de- novo.
3. It is a term of the Agreement that the party invoking the arbitration shall specify all disputes to be referred to arbitration at the time of invocation of arbitration under the clause.
4. It is a term of the contract that the cost of arbitration shall be borne by the parties themselves.
5. The place of the arbitration shall be Kanpur Nagar, Uttar Pradesh, India.
6. Subject as aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications, amendments or re-enactment thereof and rules made thereunder and for the time being in force, shall apply to the arbitration proceeding under this clause.

7. Except as otherwise provided anywhere in this Agreement, the Arbitration proceedings shall be conducted in English and the Agreement shall be constructed, interpreted and governed by the law of India, for the time being in force.

20.15 Jurisdiction of Courts

The court(s) at Kanpur Nagar, Uttar Pradesh, shall have the exclusive jurisdiction to try any as all the disputes(s) between the parties arising out this Agreement.

20.16 E&M Works

1. In interpreting the specifications, the following order of decreasing importance shall be followed in case of contradictions:
   (a) Schedule of quantities
   (b) Technical specifications of the NIT
   (c) Approved Drawing (If any)
   (d) CPWD General specification Part – I (Internal) 2014, BIS Codes amended up to date, practices
   (e) CPWD General Specifications for Electrical Works–Part-II(External), 2014 amended up to date.
   (f) Relevant IS or other international code in case IS code is not available.
   (g) Indian Electricity Act 2003 and Indian Electricity Rules 1956 amended up to date.
   (h) Local Fire Regulations applicable at the place of installation. Relevant and applicable foreign standards and specifications amended up to date.
   (i) Any other relevant act or rules and local by-laws.
2. contractor will identify one of the supervisors for taking care of implementation of Safety systems.
3. Smoking is strictly prohibited at workplace.
4. Nobody is allowed to work without wearing safety helmet. Chinstrap of safety helmet shall be always on. Drivers, helpers and operators are no exception.
5. No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level.
6. No one is allowed to work without adequate foot protection.
7. Usage of eye protection equipment shall be ensured when workmen are engaged for grinding, chipping, welding and gas-cutting. For other jobs as and when site safety co-coordinator insists eye protection has to be provided.
8. All safety appliances like Safety shoes, Safety gloves, Safety helmet, Safety belt, Safety goggles etc. shall be arranged before starting the job. .
9. All excavated pits shall be barricaded & barricading to be maintained till the backfilling is done. Safe approach to be ensured into every excavation.
10. Adequate illumination at workplace shall be ensured before starting the job at night.
11. All the dangerous moving parts of the portable / fixed machinery being used shall be adequately guarded.
12. Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms.
13. Material shall not be thrown from the height. If required, the area shall be barricaded and one person shall be posted outside the barricading for preventing the trespassers from entering the area.

14. Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.
15. All electrical connections shall be made using 3 or 5 core cables, having a earth wire.
16. Inserting of bare wires for tapping the power from electrical sockets is completely prohibited.
17. A tools and tackles inspection register must be maintained and updated regularly.
18. Debris, scrap and other materials to be cleared from time to time from the workplace and at the time of closing of work every day.
19. All the unsafe conditions, unsafe acts identified by contractors, reported by site supervisors and / or safety personnel to be corrected on priority basis.
20. No children shall be allowed to enter the workplace.
21. All the lifting tools and tackles shall be stored properly when not in use.
22. Clamps shall be used on Return cables to ensure proper earthling for welding works.
23. Return cables shall be used for earthling.
24. All the pressure gauges used in gas cutting apparatus shall be in good working condition.
25. Proper eye washing facilities shall be made in areas where chemicals are handled.
26. Connectors and hose clamps are used for making welding hose connections.
27. All underground cables for supplying construction power shall be routed using conduit pipes.
28. Spill trays shall be used to contain the oil spills while transferring / storing them.
29. Tapping of power by cutting electric cables in between must be avoided. Proper junction boxes must be used.
30. All the E&M works shall be carried out as per direction and to the satisfaction of the Engineer-in-charge.
31. If the specifications for any item or its component are not available in the CPWD spe- cifications cited above, relevant BIS specification as amended up to date shall be followed, whether or not the specific reference of a particular BIS specification has been made in this specification/ tender document.
32. Wherever any reference to any Indian Standard specification occurs in the document relating to this contract the same shall be inclusive of all amendments issued there to or revisions thereof, if any, up to the date of opening of tenders.
33. All materials should conform to relevant BIS specifications wherever the same exists in absence of stipulation in this tender document.
34. Where manufacturers furnish specific instructions / recommendations relating to the ma- terials used in this job and/or their installation, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases and shall be deemed to be included in the schedule of work whether they have been specifically mentioned or not.

35. All chase cuttings in the wall, for recessed conduits & boxes and drilling the holes shall be done with power operated machines only. No chase shall be allowed to be cut manually with the use of hammer & chisel.

36. All cuttings in cement plaster and brick shall be made good by using cement mortar 1:3 (1 part cement, 3-part coarse sand) The cut surfaces shall be repaired by an experienced mason only so as to match the repaired plaster with the original. All such repaired surfaces shall be cured for 3 to 4 days to keep the surfaces wet, using water spray machine (hand/motor operated) and avoid unnecessary flooding of the area.

37. The structural and architectural drawings shall at all times be properly co-related before executing any work.

38. For the purpose of recording measurements and preparing running account bills, the abbreviated nomenclature indicated in the publications Abbreviated Nomenclature of Items of DSR 2022 shall be accepted. The abbreviated nomenclature shall be taken to cover all the materials and operations as per the complete nomenclature of the relevant items in the agreement and relevant specifications. In case of items for which abbreviated nomenclature is not available in the aforesaid publication and also in case of extra and substituted items for which abbreviated nomenclature are not provided for in the agreement, full nomenclature of item shall be reproduced in the measurement books and bill forms for running account bills. For the final bill, however, full nomenclature of all the items shall be adopted in preparing abstract in the electronic measurement books and in the bill forms.

39. The following drawings must be submitted to Executive Engineer within seven days of award of work.

    (a) Completely filled-in Technical Parameters of all equipment's i.e. Power Transformers, VCB, CT, PT, Isolators, DG sets, and cables.

    (b) Design and drawing of the bus bar gantry structure, equipment structure etc.

    (c) G.A and schematic drawings of HT switchgear, C& R panel, RTU Panel, DG Sync panel, wiring drawing, control cabling, i/c details of protection, metering, indicating and inter lock etc.

    (d) Control Cable schedule, Conduit layout for lights, fans, socket outlets, telephone outlets, network & fire alarm system and sub mains showing size of conduits, no. of wires and size of wires in each run, location and size of accessories like junction boxes, ceiling boxes for hooks, draw boxes and switch boxed etc.

    (d) Cable routing drawings showing details of size, type and no. of cables and mode of installation.

    (e) Foundation drawings of all equipment's of the substation.

40. On completion of works and before issuance of completion certificate, the contractor submit completion drawings in the form of three complete set of originals (reproducible).

    (a) All the as built drawings as mentioned above at sr.no. 39

    (b) Testing and commissioning reports of substation with all equipment's and DG sets with sync panel

    (c) Technical literature, test certificates and operation and maintenance manuals of all equipment's.

41. Works Inspection and Testing of Equipment: Prior to dispatch of equipment the Institute reserves the right to inspect the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection/testing, for witness of all acceptance and routine tests as per relevant Indian Standards.

    Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipment's.

42. Pre-commissioning test: All routine and site tests shall be carried out on the electrical equipment as per the Indian Standard. Protective & metering devices should be checked for calibration of relays, C&R panel & cable meggaring, earthing measurements etc.

केन्द्रीय लोक निर्माण विभाग

कार्यालय ज्ञापन

No. DG/MAN/410

ISSUED BY AUTHORITY OF DIRECTOR GENERAL, CPWD

NIRMAN BHAWAN, NEW DELHI DATED: 22.10.2021

Subject: Addition of new Para 4.10.2 in CPWD Works Manual 2019 regarding testing charges to be borne by contractor.

It has been noticed that following provisions are sometimes being made in the NITs / Agreements by the NIT approving authorities:

"The cost of test shall be borne by contractor/ department in the manner as below:

i. By the contractor, if the result shows that material does not conform to the relevant codes/ specification,
ii. By the department, if the results show that the material conforms to relevant codes/ specification."

It has been decided by the competent authority that testing charges shall be borne by the contractor in all cases. Accordingly following new para is added in CPWD Works Manual -2019.

Existing Provision	Modified Provision
4.10 Preparation of NIT	**4.10 Preparation of NIT**
4.10.2 No Provision	**4.10.2 Testing charges to be borne by contractor** **Following provision shall be incorporated by the NIT approving authority in the NIT:** **All expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. including testing charges shall be borne by the contractor. The NIT shall have list of approved laboratories for testing as approved by ADG / SDG.**

This issues with the approval of competent authority.

(वी.पी. साहू) 22.10.2021

अधीक्षण अभियंता(सी.एंड एम.)

Issued from file No. CSQ/CM/16(1)/2021 e-file 9116587

प्रतिलिपि: सभी केलोनिवि तथा लोनिवि दिल्ली के अधिकारियों को आवश्यक सूचना एव कार्यवाही हेतु।(केलोनिवि वेबसाईट के माध्यम से).